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AMERICAN JOURNAL OF OPHTHALMOLOGY
VOLUME 16 MARCH, 1933 NUMBER 3

EXPERIMENTAL STUDIES IN DIATHERMY APPLIED TO THE EYE AND ORBIT

B. Comparison of thermal effects of diathermy, infrared radiation and electric heating pad

WILLIAM F. MONCREIFF, M.D., JOHN S. COULTER, M.D.,
AND H. J. HOLMQUEST, B.S. (M.E.)
CHICAGO

A comparison of diathermy, infrared, and heating pad tested on dogs indicates that they are effectual in producing heat in the tissues in the above order. The power of penetration also follows this order. From the Department of Ophthalmology and the Department of Physical Therapy, Northwestern University Medical School.

In a previous communication[1], we reported experiments on narcotized dogs in which by the application of diathermy currents of 600 ma., for fifteen minutes, there was an average maximum temperature elevation of 4.49° C. in the orbit, 6.98° C. in the cavum oculi and 7.11° C. in the conjunctiva. During the progress of this work, we became interested in determining the comparative heating effects of diathermy and other methods of heat production such as radiation and conduction. The infrared generator was selected as the radiation modality for comparison, and a specially constructed electric resistance heating pad as the conduction method. Methods of application of moist heat conduction were not included in this investigation because of the impracticability of maintaining external temperatures within sufficiently narrow limits of variation by such measures.

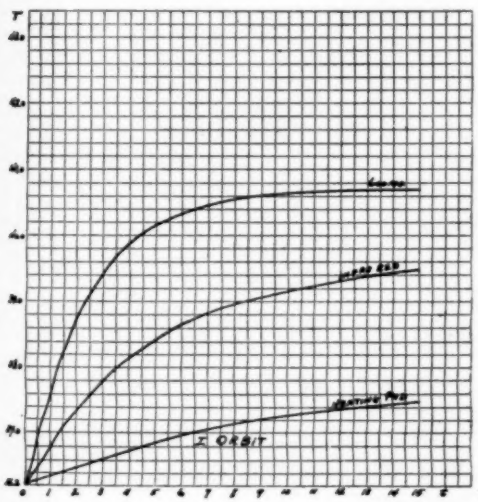

Fig. 1. Curves representing rise in temperature in orbit, from diathermy (600 ma.), infrared, and heating pad during fifteen minutes.

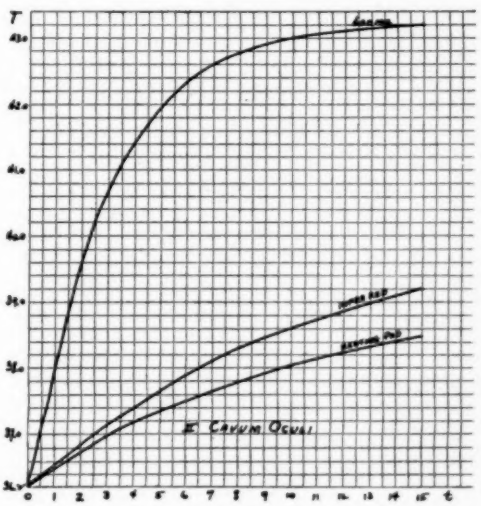

Fig. 2. Same as figure 1, for cavum oculi.

[1] Amer. Jour. Ophth., 1932, v. 15, no. 3, p. 194.

Methods employed in radiation and conduction experiments

The same methods of measurement of temperature, and similar anesthesia for the dogs, and other technical details, were used in this series of experiments as in those reported in our first article. The effect of radiant heat was investigated by means of an infrared generator of 220 watts with a maximum in-

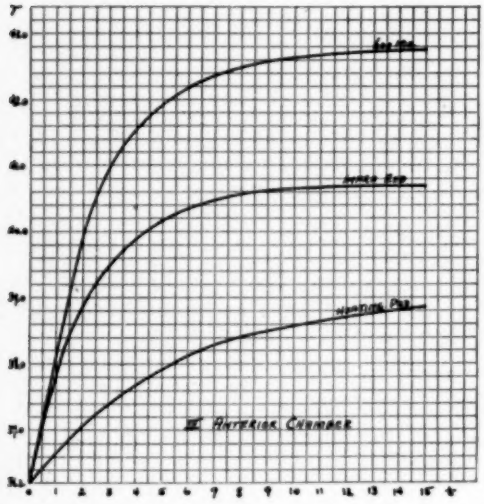

Fig. 3. Same as figure 1, for anterior chamber.

tensity of radiation at approximately 30,000Å, placed at a distance of twelve inches from the surface of the eyelids, the direction of radiation being approximately along the axis of the orbit. The effect of heat by conduction alone was investigated by the use of an electric heating pad constructed of coiled resistance wire embedded in an asbestos matrix between asbestos sheets. The temperature of this pad was maintained between 52.0° C. and 55.0° C. by means of a variable resistance in the circuit.

Because of the limited tolerance of the superficial tissues, especially the cutaneous integument of the eyelids, for the application of heat by radiation with the infrared generator, and particularly by conduction from the heating pad, it was found impracticable to prolong the period of observation beyond fifteen minutes, although this proved to be an insufficient time to reach a maximum temperature by these methods in the deeper zones.

Discussion of experimental data

In considering the rise of temperature attained by comparison of each of the three methods of heat production, it should be borne in mind that each method was applied to the maximum limit of tolerance of the superficial tissues, and that the rôle of conduction of heat from without inward, or from the surface to the deeper tissues, is of special importance. In the case of diathermy, heat production is greater beneath the surface than on the surface and the rôle of conduction in the heating of the deeper tissues is a very secondary one, while in the case of radiation with infrared rays, heat production

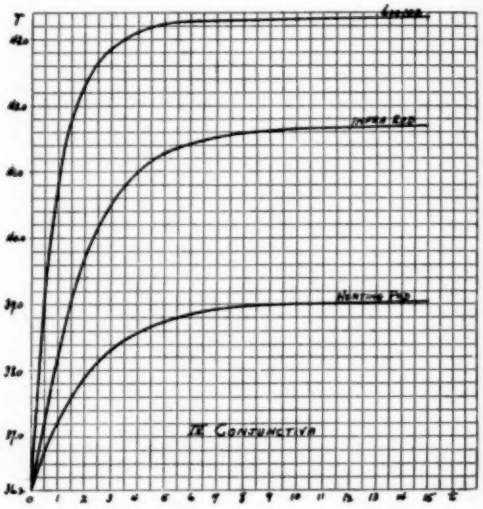

Fig. 4. Same as figure 1, for conjunctiva.

is primarily within the superficial tissues, with conduction of heat from these to the deeper tissues playing a rôle of greater importance than in the case of diathermy. In the case of the electric resistance heating pad, the greatest concentration of heat is on the skin surface, so that rise of temperature not only in the deeper tissues, but also in the superficial tissues as well, is dependent entirely upon conduction of heat from without inward.

With these facts in mind, we may

logically infer that when each of these methods of heat production and application is employed for comparison, up to the maximum tolerance of the skin, the greatest input of energy into the tissues, as well as the greatest tolerance of the skin, will be in the case of diathermy, while radiation with infrared rays will rank second, and the heating pad third and least both as to energy input and skin tolerance.

The relative efficiency of each of these three methods of heat production in each of the four zones studied is shown in the accompanying tables and graphs. It is at once seen that considerably higher temperatures were produced in each zone by the diathermy current of 600 ma., than by the other methods. No disproportionately high rise of temperature in the cavum oculi was noted in the case of radiation by infrared rays, or conduction heating by the electric pad, as was observed with the 600 ma. diathermy current. The temperatures produced in the several zones by infrared radiation show a relatively uniform gradient from without inward, or from anterior to posterior zones, with the exception of a less marked rise in the cavum oculi, just as was found with the diathermy currents of lower intensities.

The maximum temperature rise, only 2.8° C., produced by the heating pad, was in the conjunctiva. Temperature

Table 1

ORBIT

A. Infrared radiation

Weight	Pulse	Respiration	Temp. 0 min.	Temp. 5 min.	Temp. 10 min.	Temp. 15 min.	Rise
44	160	34	39.45	40.33	40.53	40.45	1.00
33.5	128	10	37.75	38.58	39.20	39.30	1.55
26	120	20	38.40	39.10	39.68	39.93	1.53
35	180	60	38.40	39.57	39.90	40.20	1.80
35	180	60	39.45	40.22	40.40	40.50	1.05
32	160	36	36.45	37.15	37.32	37.40	.95
32	160	36	36.82	37.42	37.73	37.80	.92
34	146	20	38.13	39.55	40.00	40.10	1.97
34	146	20	38.30	39.80	40.05	40.15	1.85
			38.13	39.08	39.42	39.54	1.40

B. Electric heating pad

—	140	34	33.87	33.90	33.82	33.85	0.00
33.5	128	10	38.68	38.55	38.65	38.70	0.02
36	170	20	39.35	39.40	39.45	39.58	0.23
26	120	20	39.10	39.35	39.38	39.30	0.20
			37.75	37.80	37.83	37.86	0.11

C. 600 ma. Diathermy current

44	160	36	39.60	41.20	41.25	41.05	1.45
33.5	128	14	38.10	39.70	40.00	39.95	1.85
36	170	20	39.15	41.50	41.60	41.70	2.55
26	120	20	38.60	40.60	40.90	40.95	2.35
25	160	32	35.00	37.10	37.30	37.25	2.25
25	160	32	35.05	37.30	37.60	37.65	2.60
25	160	28	36.90	39.80	40.50	40.60	3.70
25	170	64	40.30	44.20	43.85	44.08	3.78
38	160	25	38.25	40.35	40.85	40.95	2.70
40	140	16	39.43	41.80	42.00	42.30	2.87
40	140	20	39.95	40.65	41.40	41.50	1.55
			38.20	40.38	40.66	40.72	2.50

elevations only slightly less marked were produced by the heating pad within the eyeball itself, but the rise of temperature produced near the apex of the orbit was considerably less, only 1.3° C. It may be noted that in each zone the rise of temperature produced by the 600 ma. diathermy current was 3.0° C. or more, in excess of that produced by the heating pad, and that in the anterior zones, the rise produced by infrared radiation was approximately 2.0° C. in excess of that produced by the heating pad.

Summary and conclusions

Studies of radiant heat by means of infrared rays and of conduction heat by means of an electric resistance heating pad, applied to the eye and orbit in narcotized dogs, were made for comparison with studies of diathermy previously reported.

Comparison of the results demon-

Table 2

CAVUM OCULI

A. Infrared radiation

Weight	Pulse	Respiration	Temp. 0 min.	Temp. 5 min.	Temp. 10 min.	Temp. 15 min.	Rise
25	110	50	36.30	36.80	37.10	37.65	1.35
25	150	22	35.30	36.63	37.93	38.10	2.80
33.5	128	10	37.60	38.30	39.10	39.55	1.95
36	170	32	39.15	40.13	41.15	41.35	2.20
26	120	20	39.30	39.70	40.00	40.25	0.95
35	180	50	39.80	40.30	40.80	40.83	1.03
32	160	36	38.25	39.10	39.60	39.83	1.58
32	160	36	39.00	39.70	40.20	40.25	1.25
34	146	20	37.05	37.75	37.93	38.43	1.38
34	146	20	37.60	38.55	38.83	38.90	1.30
34	146	20	38.05	38.70	38.90	38.95	0.90
32	190	84	38.65	39.75	40.00	40.20	1.55
32	190	60	39.83	40.55	40.90	41.18	1.35
			38.15	38.92	39.42	39.65	1.50

B. Heating pad

25	120	30	37.73	38.45	38.80	38.60	0.87
33.5	128	10	38.70	38.75	39.08	39.10	0.40
32	190	60	40.65	41.30	41.35	41.40	0.75
32	190	60	41.05	41.15	41.20	41.25	0.20
23	160	56	36.05	36.20	37.22	37.48	1.43
23	160	56	35.45	36.45	36.88	36.75	1.30
42	124	40	36.40	37.10	37.25	37.35	0.95
—	—	—	36.75	37.30	37.65	37.80	1.05
—	—	—	36.85	37.70	—	38.00	1.15
—	—	—	37.30	—	38.00	38.05	0.75
			37.69	38.26	38.60	38.58	0.89

C. 600 ma. Diathermy current

36	170	32	39.85	43.88	43.90	43.75	3.90
26	120	20	38.55	42.03	43.70	43.80	5.25
35	180	52	39.50	42.38	42.65	42.78	3.28
35	160	52	39.55	42.20	42.60	42.65	3.10
32	160	36	37.38	42.05	42.80	43.00	5.62
32	160	36	38.08	42.00	42.90	42.63	4.55
30	164	56	37.60	42.38	43.33	42.98	5.38
30	164	56	38.43	42.13	42.63	42.83	4.40
			38.62	42.38	43.06	43.05	4.43

Table 3

ANTERIOR CHAMBER

A. Infrared radiation

Weight	Pulse	Respiration	Temp. 0 min.	Temp. 5 min.	Temp. 10 min.	Temp. 15 min.	Rise
25	120	28	36.30	37.20	37.95	38.50	2.20
33	160	48	36.25	41.05	41.15	41.05	4.85
33	160	48	37.63	40.20	40.88	41.05	3.42
33	160	48	37.53	40.60	41.00	41.00	3.47
33	160	48	39.05	41.05	41.40	41.30	2.25
33	160	48	38.90	41.05	41.45	41.60	2.70
33	160	48	39.85	41.30	—	41.78	1.93
			37.93	40.35	40.64	40.89	2.97

B. Heating pad

25	120	30	36.20	38.38	39.25	39.20	3.00
19	148	100	36.35	36.85	37.65	37.68	1.33
19	148	100	35.60	38.05	38.15	38.05	2.45
19	148	88	35.40	—	39.00	38.98	3.58
			35.89	37.76	38.52	38.50	2.59

C. 600 ma. Diathermy current

22	148	34	36.15	41.43	42.48	42.75	6.60
22	148	34	36.45	41.25	42.95	42.75	6.30
22	148	34	36.60	41.53	42.25	42.10	5.50
22	148	34	35.60	43.50	42.85	42.25	6.65
			36.20	41.93	42.63	42.46	6.26

Table 4

CONJUNCTIVA

A. Infrared radiation

Weight	Pulse	Respiration	Temp. 0 min.	Temp. 5 min.	Temp. 10 min.	Temp. 15 min.	Rise
16	192	32	38.68	41.83	42.13	42.23	3.55
16	192	32	39.78	42.53	42.88	43.43	3.65
16	192	32	36.32	40.83	41.03	41.00	4.68
16	192	32	37.73	40.93	41.08	41.03	3.30
16	192	32	38.18	40.98	41.28	41.43	3.25
			38.14	41.42	41.68	41.82	3.69

B. Heating pad

26	—	20	38.38	39.35	38.95	39.00	0.62
26	—	20	36.65	39.15	39.55	38.70	2.05
26	—	20	36.00	37.90	38.75	39.10	3.10
			37.01	38.80	39.08	38.93	1.92

C. 600 ma. Diathermy current

			0 min.	2 min.	4 min.
31	180	48	37.20	41.45	42.00
31	180	48	36.85	43.45	43.95
31	180	48	37.60	43.80	43.35
31	180	48	37.20	43.20	43.93
31	180	48	37.15	42.95	43.45
32	180	44	38.70	39.65	—
32	180	44	39.30	43.05	42.50
			37.71	42.51	43.20

Table 5

SUMMARY AFTER TRANSLATION OF CURVES TO COMMON INITIAL TEMPERATURE OF 36.20°C.

Ocular Zone	Modality	Equation	Temp. 0 min.	Temp. 2 min.	Temp. 5 min.	Temp. 10 min.	Temp. 15 min.	Rise
Orbit	Heating pad	$T=37.875-1.675\,e^{-0.102\,t}$	36.20	36.51	36.87	37.27	37.51	1.31
	Infrared radiation	$T=39.61-3.40\,e^{-0.205\,t}$	36.20	37.35	38.39	39.17	39.45	3.25
	Diathermy 600 ma.	$T=40.7-4.48\,e^{-0.41\,t}$	36.20	38.73	40.12	40.63	40.69	4.49
Cavum Oculi	Heating pad	$T=39.11-2.91\,e^{-0.103\,t}$	36.20	36.76	37.36	38.06	38.49	2.29
	Infrared radiation	$T=40.35-4.15\,e^{-0.086\,t}$	36.20	36.90	37.65	38.60	39.22	3.02
	Diathermy 600 ma.	$T=43.22-7.00\,e^{-0.342\,t}$	36.20	39.68	41.95	42.99	43.18	6.98
Anterior Chamber	Heating pad	$T=39.03-2.83\,e^{-0.18\,t}$	36.20	37.03	37.88	38.56	38.84	2.64
	Infrared radiation	$T=40.68-4.48\,e^{-0.425\,t}$	36.20	38.88	40.16	40.62	40.67	4.47
	Diathermy 600 ma.	$T=42.75-6.55\,e^{-0.42\,t}$	36.20	39.92	41.94	42.65	42.74	6.54
Conjunctiva	Heating pad	$T=39.02-2.82\,e^{-0.44\,t}$	36.20	37.92	38.74	38.99	39.02	2.82
	Infrared radiation	$T=41.70-5.50\,e^{-0.508\,t}$	36.20	39.70	41.28	41.67	41.70	5.50
	Diathermy 600 ma.	$T=43.31-7.10\,e^{-0.97\,t}$	36.20	42.28	43.25	43.31	43.31	7.11

strates that the skin and superficial tissues tolerate the diathermy currents to a maximum of 600 ma., and also the infrared radiation, better than conduction heat from the electric resistance heating pad, so that a greater input of energy and consequently a greater rise of temperature is produced by diathermy than by either of the other two methods, and by infrared radiation than by conduction heat from the electric heating pad. It is significant that even in the anterior zones the heating power of diathermy, within the limits of skin tolerance, is greater (about 2.0° C.) than that of infrared radiation, and much greater (about 4.0° C.), than that of the heating pad.

CERTAIN MOTOR ANOMALIES OF THE EYE IN RELATION TO PRESCRIBING LENSES

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PAUL T. CONNOLLY, M.D.
AND
DOROTHY KERN
NEW YORK

In the following paper the authors point out some reasons why glasses that correct errors of refraction do not always provide visual comfort for the wearer. Read before the Canadian Medical Association, June 23, 1932, in Toronto, Canada. From the New York Eye and Ear Infirmary and the Lighthouse Eye Clinic.

Most ophthalmologists recognize the importance of motor anomalies in relation to prescribing lenses, yet a routine muscle examination is seldom made[1] even in private practice, and a study of the clinic records of eleven eye hospitals in the eastern section of the United States shows that reference to the ocular muscles was made in less than 0.5 percent of the records examined. A complete routine examination of the ocular muscles was not once recorded.

Examination of the ocular muscles is time-consuming but the screen and parallax tests, at six meters and twenty-five centimeters, and the determination of the near point of convergence and the near points of accommodation require little time, and these tests are adequate for the diagnosis of many of the motor anomalies to be considered in prescribing lenses. A trained nurse or an intelligent lay assistant may be instructed to make the complete routine examination or the shorter tests. We agree with Goar and Ralston[2] that ophthalmologists who make routine examinations of the ocular muscles will often "be spared the humiliation of being told their glasses are no good."

Because asthenopic symptoms are not always relieved by wearing lenses, ophthalmologists may soon find it advisable in certain cases, to make complete functional examinations of the intraocular and extraocular muscles and of the retina, in addition to thorough studies of errors of refraction.

A routine examination for detecting motor anomalies.* A routine method of examining the ocular muscles has been described.[1] In office practice a detailed medical and ocular history is recorded and special and laboratory examinations are made when indicated. Patients who complain of asthenopic symptoms are usually tested by means of the ophthalmic ergograph for fatigue of convergence and accommodation. We have previously pointed out how these tests may be made without special apparatus[3, 4]. In some cases we find the occlusion test as suggested by Marlow[5] valuable. It is usually more profitable to study the function of the ocular muscles than the rest position of the eyes, especially if orthoptic training is considered of benefit or if one does not

* Abbreviations used in the text and in the illustrations: X=exophoria at 6 M.; E=esophoria at 6 M.; X′=exophoria at 25 cm.; E′=esophoria at 25 cm.; P.P.=near point of accommodation; Pc=near point of convergence; Pc.B=Pc. to the intercentral base line.

wish to prescribe prismatic lenses or operate before other measures have been tried.

What is normal balance of the ocular muscles? It is difficult to define normal balance of the ocular muscles. Moreover, the study of the functional capacity of the muscles seems to be as important as the determination of errors of refraction and the estimation of slight degrees of heterophoria. The position of the ophthalmologist of today is similar to that of the cardiologist who now attaches greater importance to studies of the function of the heart than to structural defects as evidenced by murmurs.

From the study of 300 consecutive records, in which complete muscle examinations were made, and the examination of 225 men, selected because their eyes were considered normal for aviation, the following arbitrary standard for orthophoria has been suggested:

1. The near point of convergence must not exceed 100 millimeters.*
2. Not over 3^{Δ} of esophoria, 2^{Δ} of exophoria, or 1^{Δ} of hyperphoria at six meters.
3. Not more than 6^{Δ} of exophoria, 1^{Δ} of esophoria or hyperphoria at twenty-five centimeters.

Prism divergence at six meters should not be greater than 9^{Δ} or less than 4^{Δ}, and prism convergence at six meters and twenty-five centimeters should be at least twice as great as prism divergence at the first examination when a prism rack is used (weak to strong prism method[6]).

Prescribing Lenses in Heterophoria

Divergence insufficiency (hypokinesis). Patients whose prism divergence is less than 4^{Δ} at six meters as tested with a prism rack, in which the difference between the prisms is 1^{Δ}, have divergence insufficiency, provided associated lateral movements are normal. Patients with divergence insufficiency usually have 1^{Δ} to 9^{Δ} of esophoria at six meters and twenty-five centimeters, but in primary divergence insufficiency orthophoria or even slight exophoria may be found at both distances. Wearing a prism, base out, is of benefit in some of these cases of divergence insufficiency but we have also found prism diverging exercises of value. If the patient has esotropia it may be necessary for him to do diverging exercises by recession, that is, have the patient hold a red glass over one eye, approach a light until the images are superimposed, then walk gradually away from the flame. This may be varied by having the flame carried away from the patient, and the difficulty of the exercise may be increased by using prisms, base in. At first, it may be necessary to use the prisms, base out, in order to fuse the lights. If divergence insufficiency is associated with weakness of the external recti, abducting exercises are also of value. This type is not a pure example of divergence insufficiency.

If hyperopia is present, it should be rather completely corrected and myopia slightly undercorrected, especially if convergence excess is primary and divergence insufficiency secondary. Low degrees of hyperphoria should be searched for and corrected with prisms. At times prisms, base out, have apparently relieved symptoms, the most annoying of which is panoramic headache. Prisms, base out, are usually prescribed as a last resort and the strength to be incorporated in the lenses is determined by first prescribing them in a clip-on frame until the most comfortable strength has been found. If these methods of treatment, combined with correction of the general health, fail to relieve the patient of annoying symptoms, resection of one or both external recti may be indicated in cases of primary divergence insufficiency. Retroplacement of one or both medial recti may be performed to correct primary convergence excess.

Divergence excess (hyperkinesis). If associated lateral movements are normal and exophoria at six meters is more than 2^{Δ}, the presence of divergence excess is suspected. We usually find more than 9^{Δ} of prism divergence at six

* Further limited by decades, i.e., 20 yrs.—60 mm.; 30 yrs.—70 mm.; 40 yrs.—80 mm.; and 100 mm. as the upper limit.

meters at least at the second examination, if the prism rack is used. Marked exophoria or exotropia may be found at six meters, and quite commonly periodic exotropia, one eye tending to diverge suddenly. Most of these patients have normal converging power with a good near point of convergence and very often good prism convergence. Prismatic lenses are seldom prescribed for these cases unless the patient requires lenses for constant use, or the exophoria is of low degree, or the patient cannot or will not do prism converging exercises. It has been previously pointed out[7] that satisfactory results may sometimes be obtained with prism converging exercises even when patients have exotropia, especially if associated with myopia. The following case history (case 1) illustrates the value of prism exercises.

Case 1. B. C., male, aged eleven years, was first examined November 6, 1924. He was wearing O.D.: —4.50 D. sph. ⊂ —.75 D. cyl. axis 165° and in the O.S.: —6.50 D. sph.= —.75 D. cyl. axis 110°. The vision in each eye with this correction was 20/25. At six meters there was exotropia of 30Δ and left hypertropia varied from 3Δ to 4Δ; at twenty-five centimeters there was periodic exotropia of 25Δ, and left hypertropia of 3Δ. The near point of convergence was 115 millimeters. The faithful use of converging exercises on a line, converging exercises with prisms, and with prisms and red glass improved the condition so that examination October 12, 1926, showed muscle balance: at six meters, exophoria 5Δ, prism divergence 15Δ, and prism convergence 100Δ; at twenty-five centimeters, exophoria 5Δ to esophoria 2Δ, prism divergence 20Δ, and prism convergence 100Δ.

Many patients have been made comfortable with prism converging exercises and it has been necessary to operate on only ten of 193 private patients in whom divergence excess was diagnosed.

Divergence excess in relation to refraction. Three questions seem most important: (1) Does divergence excess have its origin in an error of refraction? (2) It is positively associated with ametropia? (3) What correcting lens should be worn? Duane[8] questions its association with a refractive error. Dunnington[9] says it is not refractive in origin. Maxwell[10] states, "Hypermetropes predominate in cases of divergence excess and myopes in convergence insufficiency." This agrees with Wootton's statement[11, 12]. We[7] found no significant correlation with ametropia of any type and summarized these data in Table I.

Divergence excess and hypertropia are commonly associated, especially in patients with exotropia. A prism that corrects part of the hypertropia, incorporated in the correcting lenses, may be of great assistance to patients attempting prism converging exercises. Prisms are seldom prescribed, base in, for constant wear unless prism converging exercises have proved unsuccessful. When patients have myopia and divergence excess, full correction should usually be worn constantly.

In divergence excess, prism converging exercises with the object placed at six meters are most important but we usually prescribe converging exercises both at six meters and twenty-five centimeters and often commence with converging exercises at the near point. If patients have exotropia at six meters, the prisms are used, base in at first, gradually decreased, and finally used base out. It is occasionally difficult to detect muscle imbalance at six meters in patients who develop an excess of convergence. If they are myopic, the exercises are finally done without correction. It is especially advisable for appearance sake that young women continue the exercises until fusion can be maintained comfortably without the myopic correction. Correct as little of the hyperopia and hyperopic astigmatism as the patient will accept and still be comfortable for distant and close work. As the power to converge improves, the correction for hyperopia and hyperopic astigmatism is diminished or eliminated, if this is possible. If operation is necessary our preference is for retroplacement[19], of one or both external recti.

Convergence insufficiency (hypokinesis). Convergence insufficiency, the most common motor anomaly, according to Duane[20] occurs in eight percent of eye patients. It should be suspected as a factor in asthenopia if the near point of convergence from the cornea

is over eighty millimeters, if the patient has difficulty in steadily fixating a three-millimeter white-headed pin held close to the near point for one minute[3], or if he complains of strain and much fatigue after the latter test, provided associated parallel movements are normal. Exophoria at twenty-five centimeters is usually more than 7Δ. Relative convergence insufficiency exists if prism convergence is not twice as strong as prism divergence the second time this functional test is made; also if prism convergence does not improve rapidly as the result of training. These are practical clinical tests. More accurately (Duane[21]) convergence insufficiency exists if the convergence index is below 30. Thus with a convergence index of 30 (probably the lowest limit of normal converging power), the distance of the convergence near point to the intercentral base line, that is, the PcB, would be 9.0 centimeters if the interpupillary distance were 54 millimeters, and 11.0 centimeters if the interpupillary distance were 66 millimeters. If prism divergence at six meters is over 9Δ, divergence excess is a complicating factor,

Table I

TABULATION OF PUBLISHED OPINIONS CONCERNING DIVERGENCE EXCESS

Author	Frequency	Correlation with refraction	Value of exercises	Primary treatment	Final treatment
Allen[18]	Common	Doubtful	Valuable and permanent	Orthoptic	Surgical
Berens, Hardy and Stark[7]	1 to 1.8% of cases in private practice	No significant correlation with ametropia of any type	Frequently valuable	Prism converging exercises at 6 M. and 25 cm. *Correction*: Myopia—full correction; Hyperopia—undercorrection; Hyperphoria—prism in lens.	Retroplacement of one or both external recti.
Bulson[16]			Very valuable	Exercises prolonged	Advancement or resection
Duane[20]	Common; 33% of exophorias	None?	Very valuable	Orthoptic	Tenotomy; will require exercises as well
Dunnington[9]	Common	None	None	Tenotomy	Tenotomy repeated
Lauder[17]			None	Prism in lens	Tenotomy (early)
Maxwell[10]		Doubtful	Frequently valuable	Orthoptic	Tenotomy
Reber[14]	Common		Very valuable in 75% of exophorias	Exercises; prism in lens	Tenotomy
Wilkinson[13]				Prism in lens; exercises	Tenotomy if above 5°
Wootton[11]	Very common	+Hyperopia	Slight	Correct refraction	Tenotomy repeated
Young[15]	Rare; 1.8% of refractions	+Hyperopia	Valuable	Minus spheres; exercises	Recession

After studying 400 patients with the ophthalmic ergograph[3, 22] we found that fatigue of convergence did not develop within the time limit of ten to fifteen minutes if the patient had normal muscle balance according to the standard for orthophoria which we have indicated. (See page 200.)

Causes of convergence insufficiency. Stutterheim[23], in considering the indications for kinetic treatment, states that convergence is a recent achievement in the process of evolution and possibly is not sufficiently developed to withstand the strain imposed by modern civilization. He has found that involuntary or reflex convergence is often insufficient, and must be supplemented by voluntary effort to give good working vision. Accommodative convergence insufficiency may result from the noncorrection or undercorrection of myopia, the overcorrection of hyperopia and presbyopia, and from wearing lenses with prisms, base in. Nonaccommodative convergence insufficiency may be caused by general neuromuscular weakness, chronic sinusitis, especially of the posterior ethmoid and sphenoid sinuses, or it may be a secondary factor in divergence excess. Convergence insufficiency after operations on the medial recti is frequently diagnosed and difficult to treat successfully.

Treatment. The scientific treatment of convergence insufficiency depends rather upon the determination and elimination of the cause than upon prescribing prisms, base in, for constant use. Correction of ametropia is important. Undercorrection of hyperopia and presbyopia is an important factor in the relief of many patients and we rarely prescribe more than +2.50 D. sph. addition in a bifocal lens. If a stronger lens is needed a separate reading lens is usually advised.

When myopic patients have convergence insufficiency, fairly strong minus cylinders and spheres should be prescribed both for distant and close work unless there is marked accommodative insufficiency. Convergence insufficiency is often associated with insufficiency of accommodation but ergographic tests seem to indicate that in certain patients there is no evidence of fatigue of accommodation although convergence fatigue is rapid. The converse may also be found.

Fatigue of convergence was marked in the following case (case 2) but no fatigue of accommodation could be detected.

Case 2. R. G., aged twenty-two years, a medical student, referred by Dr. John N. Evans, complained of headaches in the afternoon, and that his eyes tired after two hours of reading. He had been given reading glasses (+.50 D. sph. ⊂ +.50 D. cyl. axis 90° in each eye) which were of benefit. Muscle balance: at six meters exophoria ½Δ; at twenty-five centimeters exophoria 15Δ. Near point of convergence was 90 millimeters; near point of accommodation using both eyes was 135/400. Tested with the ophthalmic ergograph (records 776, 777) he developed rapid fatigue of convergence with no fatigue of accommodation (see figs. 1 and 2). Both tests were made without glasses. In the first test diplopia developed in eight minutes, nine seconds even though a 30-millimeter excursion of the test object was permitted whereas 20 millimeters is the normal limit. In the second test no fatigue developed in the time limit of fifteen minutes. This patient was greatly benefited within a period of six weeks by converging exercises with prisms.

In complicated cases any vertical deviation is usually corrected by a prism, but prisms, base in, are seldom prescribed except for elderly presbyopic patients who think they will not be benefited by exercises or for presbyopic patients whose occupation requires an unusually close near point of accommodation. Prism converging exercises are of value even in elderly patients. Some patients over seventy years of age have derived great benefit from prism converging exercises that are usually prescribed for use at six meters and twenty-five centimeters even though there is no associated divergence excess. Care should be taken to prevent the development of secondary divergence insufficiency by prescribing diverging exercises at six meters when indicated. The prism converging power is increased to 75Δ at home and 90Δ or more in the office. Suppression of one image should receive appropriate treatment.

Marked convergence insufficiency is

often most difficult to relieve. Three patients, referred by other ophthalmologists on account of marked ocular fatigue, showed insufficiency of convergence. Two of these patients were finally benefited by eliminating chronic ethmoid and sphenoid infections. One patient remained under treatment in New York for almost a year with no improvement in the use of his eyes. He returned to Dr. Harry S. Gradle who advised operation on the sinuses with subsequent rapid improvement in the ability to use his eyes.

postcycloplegic examination the patient accepted +1.00 D. cyl. axis 80° in the right eye and in the left eye +1.25 D. cyl. axis 75°. The near point of accommodation in the right eye was 110/300 and in the left eye 120/300. Depth perception with the Howard-Dolman apparatus averaged 59 millimeters.

Slight benefit resulted from orthoptic training before roentgenograms of the sinuses revealed infection in the posterior ethmoid cells. Following treatment of the sinuses and supervised orthoptic training, the patient used his eyes with greater comfort. At the last visit, May 21, 1932, he was able to do a convergence fatigue test (repeated effort), using the ophthalmic ergograph (see fig. 3). After having performed

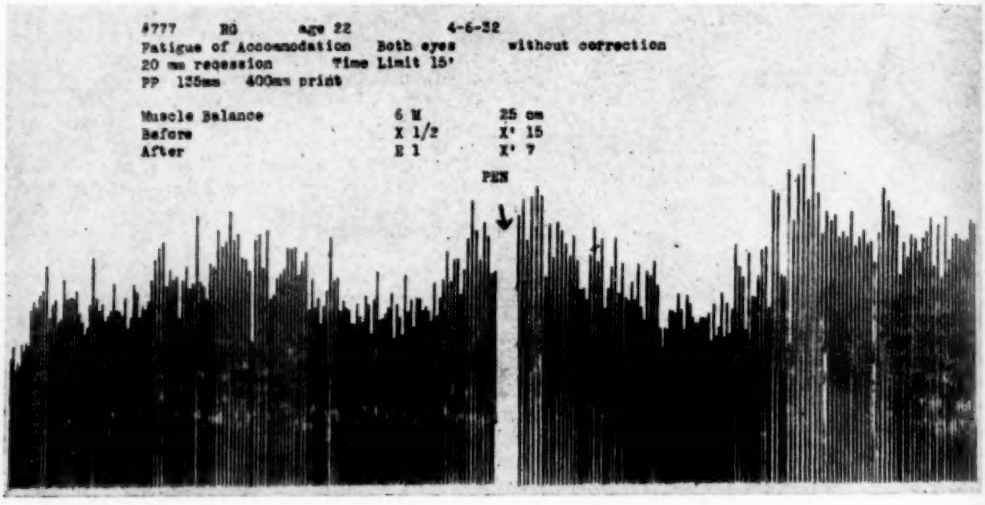
#777 RG age 22 4-6-32
Fatigue of Accommodation Both eyes without correction
20 cm recession Time Limit 15'
PP 135mm 400mm print
Muscle Balance 6 M 25 cm
Before X 1/2 X' 15
After E 1 X' 7
PEN

Fig. 1 (Berens, Connolly, Kern). Record 777 (case 2) shows no fatigue of accommodation as tested for fifteen minutes with the ophthalmic ergograph.

Many patients have difficulty in reading in spite of accurate correction of refractive errors. The following case history (case 3) of a college student with convergence insufficiency associated with divergence excess illustrates the importance not only of detecting convergence insufficiency but also determining the cause.

Case 3. P. N., male, aged nineteen years, first examined December 17, 1931, complained that his eyes tired on close application and that he could not keep up with his college studies. Near point of convergence was 300 millimeters, poorly sustained. Muscle balance: at six meters, exophoria 5Δ, prism divergence 12Δ, prism convergence 12Δ; at twenty-five centimeters, periodic exotropia 22Δ, prism divergence 30Δ. He could not overcome a 1Δ prism, base out. At the the test for four minutes, he was permitted to rest for one minute and then continued for five minutes, thirty seconds, before diplopia developed.

Insufficiency of convergence secondary to tenotomies, recession and retroplacement of the medial recti yields to orthoptic training at times but in these cases cyclophoria and hyperphoria should always be carefully investigated and treated. If there is only a low degree of hyperphoria, it will often be benefited by converging exercises on a line that is gradually reduced to a dot, and by obtaining fusion through a prism and then tilting the base to make vertical fusion more difficult. Prisms in the lenses, base up or down,

are valuable but we have seldom been gratified by the results of wearing prisms, base in, except as a temporary measure.

When convergence insufficiency is secondary to divergence excess, retroplacement of one or both external recti may have to be performed. Our experience has been that this procedure combined with prism converging exercises usually affords permanent relief. We have never resected the internal recti for convergence insufficiency uncomplicated by divergence excess. Prescribing prismatic lenses has been disappointing although they are occasionally used in a clip-on frame as a temporary measure when this procedure permits fusion at six meters in patients with secondary divergence excess.

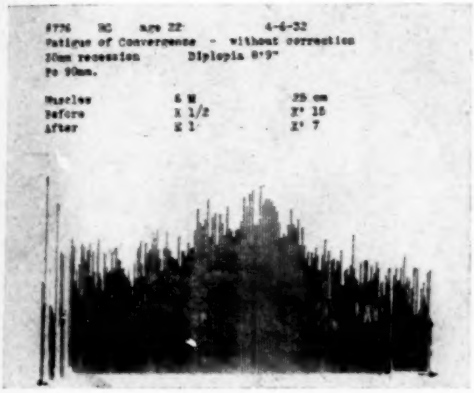
#776 HC age 22 4-6-32
Fatigue of Convergence - without correction
30cm recession Diplopia 8'9"
To 90cm.
Muscles 6 M 25 cm
Before X 1/2 X° 15
After X 1 X° 7

Fig. 2 (Berens, Connolly, Kern). Record 776 (same patient as in figure 1) shows rapid fatigue of convergence as tested with the ophthalmic ergograph. Fatigue is shown by recession of the near point of convergence after a period of improvement, and constant diplopia in eight minutes, nine seconds, long before the time limit of fifteen minutes.

Convergence excess (hyperkinesis). It is not difficult to diagnose convergence excess in persons with high prism converging power, marked esophoria at the near point, and especially in cases in which there is a periodic esotropia at the near point, when associated lateral movements are normal and there is orthophoria or esophoria of low degree at six meters. There are other cases that are more difficult to diagnose and in these we sometimes find the ophthalmic ergograph of value. The routine method employed with the ergograph consists in studying fatigue of accommodation with both eyes during a fifteen-minute test and noting whether there is a marked increase in esophoria after the test. The following case report

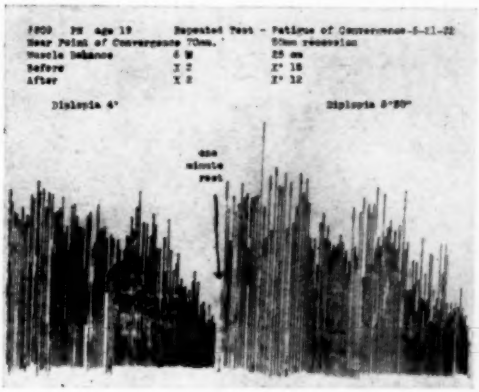
#809 FK age 19 Repeated Test - Fatigue of Convergence-5-11-32
Near Point of Convergence 70mm. 50mm recession
Muscle Balance 6 M 25 cm
Before X 2 X° 15
After X 8 X° 12
Diplopia 4° Diplopia 8'30"
one minute rest

Fig. 3 (Berens, Connolly, Kern). Record 809 (case 3) illustrates rapid fatigue of convergence in spite of correction of refractive errors. After treatment of the sinuses and orthoptic training for six months, this patient, who at first was unable to perform a sustained effort fatigue test, accomplished a repeated effort convergence fatigue test which is more difficult.

(case 4) illustrates this method of diagnosis:

Case 4. M. T., female, aged twenty-four years, complained that her eyes felt strained. Near point of accommodation 140/300, both eyes. At postcycloplegic examination she accepted no lens. Vision in each eye 20/20. Muscle balance before fatigue test: at six meters, esophoria 2Δ; at twenty-five centimeters, esophoria 3Δ. After a twenty minute test in which no sign of fatigue was noted, muscle balance at six meters, esophoria 5Δ; at twenty-five centimeters, esophoria 7Δ. (See fig. 4.)

Prism diverging exercises both at six meters and twenty-five centimeters are sometimes of value in these cases and we prefer a prism rack or loose square prisms to the constant strain of prisms in a frame favored by Reber[14]. For patients with esotropia we use the diverging exercises by recession. As much of the hyperopic and presbyopic correction is prescribed as the patient will comfortably accept and as little of the myopic correction as the patient

will accept. In myopia of low degree we sometimes prescribe no lenses and in myopia of high degree weaker myopic lenses for close work. Full correction is usually indicated for presbyopia.

Marked esophoria of spasmodic character at the near point is sometimes associated with chronic sinus infection. The following case history (case 5) is an illustration:

Case 5. P. C., female, aged thirty-eight years, was first examined January 21, 1922. Post-cycloplegic acceptance was: O.D.: +.25 D. sph. ⊂ —.50 D. cyl. axis 5°; O. S.: —.75 D. sph. ⊂ + 1.50 D. cyl. axis 95°. Vision with this correction was 20/20 in each eye. At six meters, esophoria 2Δ, prism divergence 8Δ, prism convergence 9Δ; at 25 centimeters, exophoria 8Δ, prism divergence 20Δ, prism convergence 15Δ. May 3, 1924, the patient reported severe headaches associated with cholecystitis and pituitary disorders. Maddox rod and screen test: at six meters esophoria 15Δ; at twenty-five centimeters esophoria 10Δ. The patient continued to have esophoria periodically until both ethmoids and sphenoids were exenterated in May, 1929. December 11, 1931, near point of convergence 120 millimeters; muscle balance: at six meters esophoria 2Δ, prism divergence 10Δ, prism convergence 20Δ; at twenty-five centimeters exophoria 10Δ, prism divergence 20Δ, prism convergence 30Δ. After the elimination of the sinus infection the pituitary body and gall bladder caused no further trouble.

Prescribing additional spheres for close work when young patients have esotropia as the result of convergence excess has not been especially successful. Esophoria is occasionally benefited by this procedure (see case 6).

Case 6. H. R., male, aged eighteen years, complained of tiring of his eyes upon reading. Vision 20/20 in each eye without correction. Near point of convergence forty millimeters. Near point of accommodation 100/400 each eye. Muscle balance: at six meters esotropia 14Δ; at twenty-five centimeters, esophoria 14Δ, prism divergence 10Δ, and prism convergence 50Δ. Diverging exercises with prisms for distance and near were prescribed. March 16, 1932, the vision was unchanged. At six meters esophoria 12Δ; at twenty-five centimeters esophoria 7Δ. He still complained that his eyes were strained after reading.

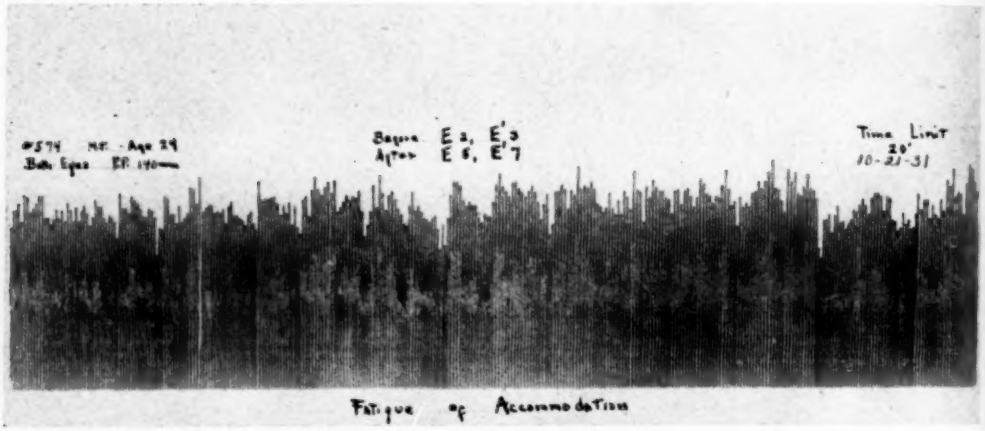

Fig. 4 (Berens, Connolly, Kern). Record 574 (case 4) illustrates the use of the ergograph in the diagnosis of convergence excess. Muscle balance before fatigue test: esophoria 2Δ at six meters, esophoria 3Δ at twenty-five centimeters; after a 20-minute test esophoria 5Δ at six meters, esophoria 7Δ at twenty-five centimeters.

April 8, 1932, muscle balance: at six meters esophoria 11Δ; at twenty-five centimeters esophoria 3Δ. Postcycloplegic acceptance, O.D.: +.50 D.cyl. axis 135° = 20/20; O.S.: +.37 D.cyl. axis 25° = 20/20. Prescription given: O.D.: + .75 D.sph. ⊂ +.50 D.cyl. axis 135° = 20/20; O.S.: +.75 D.sph. ⊂ +.37 D.cyl. axis 25° = 20/20. After reading in the office with +.50 D. spheres added, examination with the Maddox rod at 25 centimeters showed esophoria 5Δ. With +.75 D. spheres added there was esophoria 2Δ at twenty-five centimeters. Without correction, prism divergence at six meters 5Δ, prism divergence at twenty-five centimeters 7Δ. The patient says he can now diverge 9Δ for distance and 15Δ for near.

In reading tests he seems to be as comfortable with 2Δ prism, base out, in each lens as with +.75 D. sphere added to the correction. Prisms were not incorporated in the lenses because the patient did not desire to wear glasses constantly and he is now

comfortable with the reading addition. We are hopeful that the additional sphere for reading may eventually be discarded.

The most important factor in correcting convergence excess after the cause has been eliminated is to decrease the action of the overacting medial recti. Wearing prisms, base out, may be of value at times but it has not been uniformly successful in our experience. Orthoptic training with the amblyoscope, stereoscope and Wells'[24, 25] special method is of value. The cheiroscope* is helpful if amblyopia is present. The Keystone stereoscope and charts†, especially the split series, are useful. When fusion with slight amplitude is obtained, bar reading is valuable. If all these methods fail, and complicating hyperphoria has not been overlooked, retroplacement of one or both medial recti is the operation of choice provided the medial recti are spasmodic, the near point of convergence is normal, and amblyopia is not too marked.

Anomalies of Sursumvergence

Sursumvergence insufficiency is of little consequence except when associated insufficiency of an individual muscle is a complication. Sursumvergence excess may be a cause of hyperphoria and may develop in patients wearing poorly adjusted strong minus lenses and in fully corrected high anisometropia in which fusion is maintained. Careful adjustment of lenses, correction of size differences and even the wearing of a prism in the lens to overcome the deviation in the affected field are measures to be considered.

Hyperphoria and hypertropia due to hyper- and hypokinesis of individual muscles. Study of the diplopia fields and the screen and parallax test with the eyes turned from the primary position will differentiate an anomaly of sursumvergence from an affection of an individual muscle. In the study of these conditions the following measures may be considered.

Correct the vertical deviation with a prism and measure the near point of convergence, using a line, to see whether true convergence insufficiency exists. In hypertropia vertical deviation can usually be detected if the lateral error is accurately corrected by a prism and then the eyes are alternately screened for a minute or two. The vertical deviation may be detected at times by correcting the lateral deviation by prisms with a red glass held before one eye. If hyperphoria is present, especially if repeated tests show it to be of varying degree, use the Marlow[6] occlusion test and also see whether the hyperphoria varies after a test of fatigue of convergence or accommodation.

If hyperphoria is associated with esophoria or exophoria, determine whether it is true divergence insufficiency or excess, or convergence insufficiency or excess by correcting the hyperphoria and then studying the muscle balance and the function of the ocular muscles. We also make every effort to determine which muscle is at fault by studying ocular rotation, diplopia fields, fields of monocular fixation, and by measuring the deviation with prisms when the eyes are rotated downward and upward to the extreme right and left.

Treatment of Hyperphoria. Treat the cause of the paresis or spasm of the individual muscle, keeping in mind that the findings vary more in recent paralyses and that better results may be expected from nonoperative treatment. In bilateral hyperphoria or anaphoria the same muscle is usually found to be paralyzed in each eye. Before prescribing prisms in the lenses determine whether the patient is benefited by converging or diverging exercises or both, if these are indicated, combined with tilting the prisms, base up or down, in the direction opposite to that in which the correcting prisms should be worn for hyperphoria. Many patients (see case 1) have apparently been benefited by these exercises, which is contrary to Dunnington's[25a] experience and have been able to use their eyes with comfort without prismatic lenses. Sometimes it is necessary to prescribe prisms, base up or down, for close work although

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* Made by the American Optical Company, New York.

† Made by the Keystone View Company, Meadville, Pa.

the patient may be perfectly comfortable for distant work without a correcting prism. This is because the superior and inferior oblique muscles act more as elevators and depressors as the object approaches the eyes. We have no fixed rule for prescribing prisms. Sometimes full correction is necessary and we have prescribed a 5$^{\Delta}$ prism in each eye. In determining the prism to incorporate in the lens it is often useful to prescribe a clip-on frame with prisms before writing the final prescription. Tests are always made with a red glass or Maddox rod and screen to determine whether hyperphoria has been overcorrected in any field and it is especially important not to overcorrect in the lower field. One should always consider the prismatic effect of the lenses themselves and remember the especial effect of cylindrical lenses.[26] Centering should be exact[27] but decentration may be desirable in certain cases. It may be necessary to overcorrect the hyperphoria slightly in one part of the field, but the ophthalmologist should know when this is done. If the treatment suggested here fails to relieve symptoms, an operation may be advisable. This should be done only when the affected muscle or muscles have been carefully determined. Our experience has been that low degrees of hyperphoria not benefited by prismatic lenses and orthoptic training are seldom relieved of symptoms by operation. It is usually good practice to resect a weakened depressor or even an elevator but tenotomy of the inferior oblique for paralysis of the superior rectus of the other eye has given excellent results. Retroplacement of the inferior rectus for paresis of the superior oblique of the other eye and of the superior rectus for paresis of the inferior oblique of the opposite eye are measures to be considered. We agree with O'Connor[28] that hyperphoria is a common cause of asthenopia after careful correction of refractive errors and add that it frequently prevents fusion in strabismus.

Prescribing lenses in motor paralyses. A prism may be incorporated in the entire lens, as is usually done in hyperphoria, may be placed over the lower halves of the lenses in convergence paresis, and over the upper halves of the lenses in divergence excess. Ascher[29] has thoroughly studied this subject to which only brief reference can be made here. Partially frosting lenses is a most useful procedure and may be done in relation to the plotted diplopia field or by noting the point where fusion becomes difficult as a 3-millimeter white-headed pin is moved in the field of binocular fixation. See the work of Reitsch[30] for a more complete study.

Cyclophoria. Cyclophoria is undoubtedly an important factor in certain cases of asthenopia. Ames[31] and Lancaster[32] have developed an ingenious spectacle for the nonoperative treatment of this condition. Ames's[31] methods of measuring cyclofusional amplitude, cyclophoria, and cyclotropia are distinct advances in the diagnosis of motor anomalies. The correction of size differences also apparently affects cyclophoria.

Ames states,[33] "Although we believe the data so far obtained are most important and we are satisfied that there is a correlation between size differences and not only cyclophoria but also horizontal and vertical phoria, we are not advancing generalized conclusions until we have carried the work further. At present, I think we would be willing to state that the evidence shows that cyclophoria can be affected by the correction of size differences." Ames is developing an apparatus for the study of size differences and special "size lenses" are being ground for use in the refraction of patients who are troubled by size differences[34, 35].

One of the most accurate methods for testing for cyclophoria is the clinoscope[36]. Jackson[37] has suggested fusion tubes for the diagnosis and treatment of cyclophoria. A card for estimating torsion in near vision has been devised by Alexander[38].

Cyclotropia, which sometimes follows operation on the muscles, was a factor in preventing fusion in several of our patients. It is so important that we now hesitate to tenotomize the overacting inferior oblique for hypertropia before attempting to correct the hori-

zontal deviation, unless correction of the vertical deviation by prisms markedly improves the lateral deviation.

Treatment of Heterophoria and Heterotropia by Suspension of the Fusion Impulse.

Suspension of the fusion impulse has long been practiced in paresis and paralysis of the ocular muscles, certain cases of divergence excess, and especially in convergence paresis. Patients with heterophoria and lowered visual acuity in one eye due to cataract and other diseases, are often relieved by suppressing the fusion impulse. This may be accomplished[39] by excluding one eye, reducing the retinal stimulus or by measures primarily aimed at the fusion centers. A clip patch may be placed over one lens or the patient may cover one eye or develop spasmodic ptosis. The retinal stimulus may be reduced by graduated shading of the posterior surface of one lens with a white glass-marking pencil, emery cloth or by very strong plus or minus lenses; graduated "meshed" glass recommended by Snell[40] for another purpose, may also be used. The entire lens may be rendered opaque or in certain cases only that area in which fusion is difficult or impossible. A bifocal lens for one eye is useful in convergence insufficiency.[39] The fusion center may be trained to disregard the image from one eye as is done in using a monocular microscope or ophthalmoscope.

Heterophoria in Aviators

Heterophoria in aviators is a special problem, for the ophthalmologist usually does not wish to prescribe a correction because the aviator is safer, in case his goggles become displaced or soiled, if his eyes function normally without the use of correcting lenses or prisms. Orthoptic measures are frequently of value in the correction of heterophoria in aviators. This subject has been fully considered elsewhere[41].

Anisometropia

In high anisometropia, anomalies of muscle balance are usually present. If one eye is highly myopic and the other hyperopic, the myopic eye usually deviates outward. We have been surprised by the lenses which some of these patients are able to wear with comfort. There seems to be no infallible indication which will determine, without practical tests what lenses will be comfortable, but the refraction should be carefully tested, and the patient should wear the lenses for an hour or two at the postcycloplegic examination. Unless he is extremely uncomfortable, we usually prescribe lenses which correct the error of refraction rather completely in each eye. It is necessary that the glasses be properly adjusted. It is especially important to study muscle balance and function and to suggest appropriate orthoptic training with or without prisms in the lenses. Some patients with low degrees of anisometropia and hyperopia have no symptoms from these uncorrected defects even though they are nearing the age when lenses for presbyopia are often prescribed. The following case (case 7) illustrates this point.

Case 7. J. W., male, aged thirty-seven years, no ocular complaints, presented himself for routine examination. Vision was 20/20 in each eye. The near point of accommodation, right eye 190/400, and left eye 220/400. Muscle balance was normal. At six meters, prism divergence 10$^{\Delta}$, prism convergence 16$^{\Delta}$; at twenty-five centimeters, prism divergence 30$^{\Delta}$, prism convergence 65$^{\Delta}$. Under homatropine and cocaine cycloplegia he accepted +1.50 D.sph. in the right eye and +2.75 D.sph. in the left eye. He refused to wear lenses and his eyes are perfectly comfortable.

By means of the new lenses which will soon be available through the work of Ames to equalize the size of the retinal images, it may be possible to prescribe lenses which will permit binocular vision in high anisometropia. The most practical test to determine whether a patient will be able to wear a certain correction for anisometropia is to try the lenses, but the Maddox rod and screen test, the near point of convergence, stereoscopic tests, and the Bishop-Harmon diaphragm test are of value. In the Bishop-Harmon diaphragm test we use the card with the numbers 1-2-3-4-5-6-7, cover one eye and note recovery of binocular fixation.

If deviation is noted, use the small print with the inscription, "Lightly quit but lightly came" and note whether any prism aids in maintaining binocular vision. If it is difficult for the patient to perform the Bishop-Harmon test, he will probably not be contented with the new lenses[42]. In using a stereoscope Rowland[42] suggests marking the rack in centimeters from the prism. Normally the cards should be read most easily at thirteen centimeters. It has been pointed out by Weiss[43] that the prismatic effect of spectacle lenses for anisometropia and astigmatic eyes, can be overcome only by the use of multiple lenses. We believe that the disturbing effect of the prismatic defects may often be minimized by prism exercises or by decentration, which should be especially considered in overcoming hyperphoria. Lenses with corrected curves will give clearer vision in the peripheral field because of the diminished astigmatic effect.

In anisometropia of high degree, if efforts to train fusion and gain amplitude of fusion fail after the size differences have been equalized by proper adjustment of the lenses[44, 45] or by special lenses[34], it may be justifiable to suspend the fusion impulse[39]. The following case (case 8) illustrates the use of one eye for distant, the other eye for near vision.

Case 8. J. K. Van R., female, aged sixty years, complained of poor vision in the right eye. Vision was 15/200 in the right eye; 20/20 in the left eye. After refraction under a cycloplegic the patient accepted O.D.: —3.50 D.sph. ⊖ —.25 D.cyl. axis 90°; O.S.: 1.00Δ prism, base up. Addition +3.00 D.sph. for near. Near point of accommodation 300/400. Vision was 20/20 in each eye. At times there was hyperphoria of 2Δ. The patient complained of eyestrain after wearing her glasses. She was advised not to wear glasses and the left eye was used for distant vision and the right eye for reading with perfect comfort.

Professor Gullstrand taught himself to wear reading lenses with unequal near points of accommodation and found this dissociation practical and convenient for working. We have intentionally corrected presbyopia unequally in several cases with satisfactory results.

Anisometropia after cataract extraction. In these cases the eye from which the cataract has been extracted usually tends to diverge with increasing exophoria at six meters and twenty-five centimeters. We have been able to obtain binocular single vision in several of our patients by giving the strongest lens possible in the normal eye, by slightly undercorrecting the aphakic eye, and by carefully adjusting the lenses. It is important to prescribe lenses as soon as possible, especially for young patients, because of their tendency to suppress the image and to develop exotropia. In adults, in whom fusion has been well developed, the desired results are quickly obtained according to Dianoux[45]. In unilateral aphakia, Cowan[46] states that "binocular single vision is not to be considered." While we have occasionally had good results with young patients, we have not been equally fortunate in the treatment of our adult patients. The records of two of our young patients (cases 9 and 10) follow:

Case 9. V. B., male, aged twenty-four years, examined November 18, 1927. Diagnosis: Traumatic cataract left eye. May 5, 1931, an iridectomy left eye followed by anterior capsulotomy. Good pupillary opening obtained by discission. Prescription: O.D.: +.37 D.cyl. axis 180°; O.S.: +11.00 D.sph. Vision was 20/20 in each eye. A +3.75 D.sph. was added in a bifocal lens to the left eye. Converging exercises with prisms were prescribed and converging exercises on a line. April 12, 1932: Patient was comfortable and apparently fused at all times. Vision: right eye with correction 20/30; left eye 20/30. Near point of accommodation, right eye, 160/300; left eye 260/300. Muscle balance: at twenty-five centimeters, exophoria 15Δ, prism convergence 40Δ. After refraction of the left eye the glasses were changed to +13.00 D.sph. +.50 D.cyl. axis 5°, resulting in vision of 20/15. With +2.50 D.sph. added for near, the near point of accommodation was 240/300.

Case 10. J. A., male, aged twenty years, examined February 7, 1929. Diagnosis: mature traumatic cataract left eye. February 14, 1929, preliminary iridectomy was performed followed by complete discission of the lens. September 7, 1929, the following glasses were prescribed: O. D.: —.75 D.sph. = 20/15; O. S.: +9.00 D.sph. ⊖ +2.00 D.cyl. axis 165° = 20/70 with an addition of + 7.50 D. sphere for close work. Near point of accommodation, right eye 130/400; left eye 100/400. Muscle balance: at twenty-five cen-

timeters exotropia 25Δ. After using converging exercises on a line for a period, prism convergence was 8Δ at twenty-five centimeters. Prism converging exercises were then prescribed. Muscle balance at the time of prescribing prism exercises was: at six meters exophoria 10Δ (Maddox rod) and exophoria 30Δ (screen and parallax test); right hyperphoria 1Δ; at twenty-five centimeters, exophoria (screen and parallax test) 35Δ, right hyperphoria 6Δ. With great difficulty the patient was able to fuse certain stereoscopic charts by partially correcting the hyperphoria. April 13, 1932, with full correction muscle balance at six meters: exotropia 8Δ, right hypertropia 2Δ; at twenty-five centimeters, exophoria, 10Δ, prism convergence 60Δ, right hyperphoria 6Δ. He fuses well when reading.

Summary

1. Routine examination of the ocular muscles is seldom made even though the screen and parallax test at six meters and twenty-five centimeters and the determination of the near points of accommodation and convergence suffice to detect most of the important motor anomalies.

2. The management of divergence insufficiency. Wearing a prismatic lens, base out, is of benefit in certain cases but we have also found prism diverging exercises of value. Hyperopia should be completely corrected and myopia slightly undercorrected, especially if convergence excess is primary and divergence insufficiency secondary.

3. In divergence excess, full correction of myopia and undercorrection of hyperopia is indicated. Apparently there is no significant correlation between divergence excess and ametropia of any type. Prism converging exercises are sometimes beneficial even when patients have exotropia, especially if associated with myopia. Hyperphoria should usually be corrected by prisms, but prisms, base in, are seldom prescribed. It has been necessary to operate on only ten of 193 private patients in whom divergence excess has been diagnosed.

4. In convergence insufficiency, fatigue tests are of value. After testing 400 patients with the ophthalmic ergograph we found that fatigue of convergence did not develop within the time limit of ten to fifteen minutes if the patient had normal muscle balance according to the standard for orthophoria which we have indicated. The scientific treatment of convergence insufficiency depends rather upon the determination and elimination of the cause than upon prescribing prisms, base in, for constant use. Correction of errors of refraction is important. Undercorrection of hyperopia and presbyopia combined with prism converging exercises has contributed to the relief of many patients.

5. The insufficiency of convergence secondary to tenotomy, recession and retroplacement of the medial recti usually yields to orthoptic training but the patient should always be carefully examined for cyclophoria and hyperphoria, and treatment should be instituted if necessary.

6. In convergence excess, prism diverging exercises both at six meters and twenty-five centimeters are sometimes of value; patients with esotropia use the diverging exercises by recession. Prescribing additional spheres for close work when young patients have esotropia as a result of convergence excess has not been especially successful but esophoria has occasionally been benefited by this procedure.

7. Sursumvergence excess may be a cause of hyperphoria and may develop in patients wearing poorly adjusted strong minus lenses and in cases of fully corrected high anisometropia in which fusion is maintained.

8. Hyperphoria. Study of the diplopia fields will differentiate a sursumvergence anomaly from an affection of an individual muscle. In addition to treating the cause of the paresis, the following measures may be considered: a) prism exercises, tilting the prism in the direction opposite to the correcting prism while maintaining fusion; b) prismatic lenses to include part or all of the field of binocular fixation (if prisms are prescribed, tests are always made with a Maddox rod to determine whether the hyperphoria has been overcorrected in any part of the field of binocular fixation and whether the correction should differ at 6 meters and 25 centimeters); c) suppression of the fusion impulse; d) decentering lenses; e) operation.

9. Cyclophoria is undoubtedly an important factor in certain cases of asthenopia. Ames[31] has developed an ingenious spectacle for the nonoperative treatment of some of these patients. Ames's[31] methods of measuring cyclofusional amplitude, cyclophoria and cyclotropia are distinct advances in the diagnosis of motor anomalies. He states that cyclophoria can be affected by the correction of size differences and he is developing an apparatus for the study of this problem. Special "size lenses" are also being ground for use in the refraction of patients who are troubled by size differences.

10. It may be justifiable to suspend the fusion impulse in anisometropia of high degree associated with herterophoria, if efforts to train fusion and increase the amplitude of fusion fail after the prism deviation and size differences have been corrected as well as possible.

11. Binocular single vision may be obtained at times in anisometropia after cataract extraction by prescribing a strong plus or minus lens in the unaffected eye and a weak lens in the aphakic eye. It is important to prescribe the lenses as soon as possible, especially for young patients, because of their tendency to suppress the image in the aphakic eye and the early development of exotropia.

Conclusion. We believe that careful study and appropriate treatment of motor anomalies of the eyes in relation to prescribing lenses, associated with general and psychologic studies, will relieve the symptoms of many patients whose glasses are unsatisfactory.

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References

[1] Berens, C., Losey, R. R., and Hardy, L. H. Routine examination of the ocular muscles and nonoperative treatment. Amer. Jour. Ophth., 1927, Dec., v. 10, p. 910.

[2] Goar, E. L. and Ralston, W. Ocular muscles: A plea for a more thorough study. Texas State Jour. Med., 1922, v. 18, p. 31.

[3] Berens, C., Hardy, L. H., and Pierce, H. F. Studies in ocular fatigue, II. Convergence fatigue in practice. Trans. Amer. Ophth. Soc., 1926, v. 24, p. 262.

[4] Berens, C. and Stark, E. K. Studies in ocular fatigue, III. Fatigue of accommodation. History, apparatus, and methods of graphic study. Amer. Jour. Ophth., 1932, March, v. 15, p. 216; IV. Fatigue of accommodation, experimental and clinical observations. Amer. Jour. Ophth., 1932, June, v. 15, p. 527.

[5] Marlow, F. W. The determination of the relative position of rest, by prolonged occlusion of one eye. New York State Jour. Med., 1915, Nov., v. 15, p. 429.

[6] Buchanan, J. N. A comparison of two methods of applying prism tests to the eyes. Air Serv. Inform. Circ., Washington, 1920, v. 1, p. 58.

[7] Berens, C., Hardy, L. H., and Stark, E. K. Divergence excess; its incidence; its correlation with refraction; and the value of orthoptic treatment. Trans. Amer. Ophth. Soc., 1929, v. 27, p. 263.

[8] Duane, A. Motor anomalies of the eye. New York, Jenkins and Company, 1910.

[9] Dunnington, J. Concomitant divergent strabismus. Amer. Jour. Ophth., 1927, July, v. 10, p. 490.

[10] Maxwell, E. M. Concomitant squint in the practice of the late P. W. Maxwell. Brit. Jour. Ophth., 1919, v. 3, pp. 340, 408.

[11] Wootton, H. W. Divergent concomitant strabismus, the muscular anomalies and refractive errors accompanying it and its treatment. Ophthalmoscope, 1916, v. 14, p. 236.

[12] ———. Nonsurgical treatment of heterophoria in ametropia. Arch. of Ophth., 1925, v. 54, p. 440.

[13] Wilkinson, O. Exophoria: Its symptoms, significance and treatment. Wash. Med. Ann., 1909, May, v. 8, p. 104.

[14] Reber, W. The present status of the heterophoria question. Ophthalmoscope, 1914, v. 12, pp. 456, 592, 644.

[15] Young, C. A. Exophoria; analysis and treatment of 167 cases. Virginia Med. Monthly, 1926, April, v. 53, p. 25.

[16] Bulson, A. E. Discussion of divergent strabismus by B. W. Egan. Jour. Indiana Med. Assn., 1926, v. 19, p. 107.

[17] Lauder, E. Exophoria with some reference to its cause, reflex disturbances and treatment. Cleveland Med. Jour., 1910, Oct., v. 9, p. 768.

[18] Allen, S. B. Discussion of the present status of squint and ocular-motor imbalance by H. W. Wootton. New York State Jour. Med., 1915, v. 15, p. 60.

[19] Berens, C., Losey, R. R., and Connolly, P. T. Retroplacement for strabismus. Amer. Jour. Ophth., 1929, Sept., v. 12, p. 720.

[20] Duane, A. Convergence insufficiency. Jour. Amer. Med. Assn., 1914, Aug. 29, v. 63, p. 721.
[21] ———. The converging index as a measure of the converging power. Arch. of Ophth., 1914, v. 43, p. 476.
[22] Berens, C., Hardy, L. H., and Pierce, H. F. Studies in ocular fatigue. I. Convergence. The ophthalmic ergograph: its evolution and application to aviation. Contributions to Ophthalmic Science, 1926, p. 102.
[23] Stutterheim, N. A. Indications for kinetic treatment. Brit. Jour. Ophth., 1930, Monograph Supplement, No. 5.
[24] Wells, D. W. The stereoscope in ophthalmology, with especial reference to the treatment of heterophoria and heterotropia. Boston, Globe Optical Company, 1918.
[25] ———. Stereoscopic treatment of heterophoria. Trans. XIII. Internat. Cong., 1929, v. 1, p. 3.
[26] Dunnington, J. H. Hyperphoria, its etiology, diagnosis and treatment. Amer. Jour. Ophth., 1931, Nov., v. 14, p. 1140.
[27] La Placa, G. Prismatic effect of correcting cylinders. Ann. di ottal. e clin. ocul., 1925, v. 53, p. 230.
[27] Giannantoni, C. The importance of exact centering of corrective lenses in ametropia; Cases. Ann. di ottal. e clin. ocul., 1929, March, v. 57, p. 206.
[28] O'Connor, R. Diagnosis of vertical deviations of the eye. Brit. Jour. Ophth., 1924, v. 8, p. 449.
[29] Ascher, K. W. Visual aids in paralysis of the eye muscles. Klin. Monatsbl. f. Augenh., 1927, Sept., v. 79, p. 209.
[30] Reitsch, W. Partially frosted glasses in binocular diplopia from paralysis of eye muscles. Ztschr. f. Augenh., 1929, Oct., v. 69, p. 237.
[31] Ames, A., Jr. Cyclophoria. Amer. Jour. Physiol. Optics, 1924, v. 5, p. 457; 1925, v. 6, p. 65.
[32] Lancaster, W. B. Ames spectacle device for treatment of cyclophoria with report of successful case. Arch. of Ophth., 1928, July, v. 57, p. 332.
[33] Ames, A., Jr. Personal communication, April 6, 1932.
[34] ———, Jr., Gliddon, G. H., and Ogle, K. N. Size and shape of ocular images. I. Methods of determination and physiologic significance. Arch. of Ophth., 1932, April, v. 7, p. 576.
[35] Carleton, E. H. and Madigan, L. F. Size and shape of ocular images, II. Clinical significance. Arch. of Ophth., 1932, May, v. 7, p. 720.
Ames, A., Jr. and Ogle, K. N. Size and shape of ocular images, III. Visual sensitivity to difference in the relative size of the ocular images of the two eyes. Arch. of Ophth., 1932, June, v. 7, p. 904.
[36] Stevens, G. T. A new model of the clinoscope. Med. Rec., July 11, 1903.
[37] Jackson, E. Fusion tubes and their use for strabismus. Amer. Jour. Ophth., 1903, Aug., v. 20, p. 239; Simple methods of orthoptic training, Trans. Amer. Ophth. Soc., 1922, v. 20, p. 157.
[38] Alexander, G. F. Estimation of torsion on near vision. Trans. Ophth. Soc., U. K., 1921, v. 41, p. 363.
[39] Alger, E. M. Suspension of the fusion impulse as a therapeutic measure. Arch. of Ophth., 1926, v. 55, p. 438.
[40] Snell, A. C. and Sterling, S. An experimental investigation to determine the percentage relation between macular acuity of vision and macular perception. Contributions to Ophthalmic Science, 1926, p. 52.
[41] Berens, C. and Smith, H. T. Present ophthalmologic standards for commercial aviation in the United States. Trans. Amer. Acad. Ophth. & Otolaryng., 1931, p. 311.
[42] Rowland, W. D. The value of routine binocular vision tests in refraction. Jour. Ophth., Otol. & Laryng., 1925, Jan., v. 29, p. 5.
[43] Weiss, W. Prismatic defects of spectacle glasses. Deutsche ophth. Gesellsch., Jena, 1922, p. 101.
[44] Marinosci, A. Variations in retinal image and in visual acuity dependent on position of lens used for correction of ametropia. Ann. di ottal. e clin. ocul., 1930, May-June, v. 58, p. 448.
[45] Dianoux. Restitution de la vision binoculaire après l'extraction de la cataracte sur à un seul oeil. La Clin. Opht., 1919, p. 713.
[46] Cowan, A. Accessory effects of correcting glass by its position before ametropic eye. Amer. Jour. Ophth., 1930, Jan., v. 13, p. 24.

THE CHEMISTRY OF THE SCLERA

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The quantitative chemical analyses of the insoluble proteins of the sclera, mucoid, collagen, and elastin have been determined and are given in this paper. From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital, Baltimore, Maryland.

The sclera composes over half of the dry weight of the globe of the eye and anatomically, therefore, it may be considered the major tissue of the eye. It functions as a supporting structure of the inner portion of the eye, and retains its shape by the intraocular pressure. Although metabolically the sclera is passive, functionally it helps to determine the physiology of the eye.

The study of the chemistry of the sclera has been greatly disregarded in the past. From the amount of the nitrogen of the whole sclera and the nitrogen of the gelatin, which was derived from the scleral collagen, Mörner[1] calculated that the sclera consisted of about 87 percent collagen and 13 percent mucoid. He did not consider the presence of elastin. Recently it was found that the sclera contained about 5 percent elastin[2]. In 1925, Jess[3] by acid hydrolysis of the scleral gelatin which was derived from the scleral collagen, isolated 0.78 percent histidine, 2.90 percent arginine, and 11.50 percent lysine. No further analysis of the scleral proteins has been reported until the present time.

This communication is a report on the quantitative chemical analysis of the three insoluble proteins of the sclera. In a preceding paper[2] it was shown that the sclera contained insoluble protein, which was estimated to be about 81 percent collagen, 5.1 percent elastin, and 8.2 percent mucoid.

Materials. The proteins were prepared according to the method which was given in the preceding paper. The samples were ground by machine to a powder. The gelatin, which had been derived from collagen, and the elastin were dried at 105°C. to constant weight. The mucoid was dried over sulphuric acid in a vacuum dessicator to constant weight. All calculations were made on the ash- and water-free protein.

Analyses of the proteins by the Van Slyke method [4, 5]. Duplicate samples of about 2 gms. of each of the proteins were hydrolyzed by boiling for about 30 hours with 150 c.c. of 20 percent hydrochloric acid. The phosphotungstates of the bases were decomposed by the amyl alcohol-ether method[6]. The distribution of nitrogen in mucoid, gelatin, and elastin is shown in tables 1, 2, 3, and 4. The amounts of amino-acids in the protein as calculated from the Van Slyke and the colorimetric analyses are given in table 5. Table 4 shows the nitrogen partition of the proteins according to Hausmann.

Determination of tyrosine, tryptophane, and cystine. The determination of tyrosine and tryptophane was done according to the colorimetric method of Folin and Marenzi[7]. The cysteine and cystine in mucoid and elastin were estimated as cystine by the colorimetric method of Sullivan[9], and in gelatin by the colorimetric method of Folin and Marenzi[10] as modified by Tompsett[8].

Discussion

The mucoid of the sclera is classified as a glucoprotein in the group of conjugated proteins. It is an ester of a protein and of a complex organic sulfate, which is called chondroitin sulfuric acid. This acid consists of a molecule of acetylaminotalose (chondrosamine) in which one terminal hydroxyl is replaced by the sulfate group, and the other is joined to a molecule of glucuronic acid which is held together by a glucosidic linking to another compound grouping of the same structure. Chondroitin sulfuric acid has been isolated from the mucoids of cartilage, tendon, aorta, and sclera, and

has been intensively investigated[11]. The protein associated with chondrosamine, on the other hand, has been studied very little. A similar acid, called mucoitin sulfuric acid, which contains an acetylaminomannose (chitosamine) group, has been isolated from serum mucoid, ovomucoid, Funis mucin, ovarian cysts, gastric mucin, vitreous humor, and cornea[11]. The difference between the two conjugated acids lies chiefly in the linkage of the groups and in the kind of amino sugar. The part that these acids play in such metabolically inactive supporting tissues as tendon and sclera is undetermined as yet. Still it is interesting to note that chitosamine, which is highly polymerized, also occurs in the outer covering of arthropods and other invertebrates to serve as a hard supporting shell impregnated with calcium carbonate and phosphate. It is evident that there is an evolutionary chemical relationship thus shown between the mesodermal and ectodermal tissues.

It is interesting to note (see table 5) that the analyses suggest that mucoid may possibly be a precursor or closely related to keratin. The percentages of histidine, lysine, and arginine in mucoid according to the Van Slyke analysis give an approximate ratio of 1:4:12 which is similar to a ratio of the same acids which Vickery[12] found to characterize true keratins and not neurokeratins of the brain. Confirmation of this ratio would offer a large field for physiological speculation. In order to make a strict comparison of these acids, it will be necessary to determine them quantitatively in a series of mucoids and mucins by the use of Vickery's methods. The large amount of tyrosine in mucoid is also suggestive of epithelial tissues.

Collagen, the parent substance of gelatin, is a material found practically only in vertebrates. Obviously this fact and also the fact that gelatin is derived from the collagen of bone and cartilage suggest the relationship of collagen to bone formation. Bone is essentially calcium phosphate and carbonate imbedded in collagen. Collagen also forms the greater part of connective tissue. In this role, it is relatively metabolically inert, and as extracellular fibers, it is often cemented together by mucoids. Sclera and cornea are chiefly composed of this type of tissue. As shown in tables 2, 4, and 5 the analyses of gelatin hydrolyzed from scleral gelatin compare well with those of gelatin derived from bovine skin, bone, and cartilage, in that the content of

Table 1

NITROGEN DISTRIBUTION OF SCLERAL MUCOID AS DETERMINED BY THE VAN SLYKE METHOD[a]

Nitrogen	Preparation		Preparation		Average
	I[b]	II[c]	I	II	
	grams	grams	percent	percent	percent
Total N	0.2686	0.2492	12.30	12.36	12.33
Amide N	0.0182	0.0169	6.77	6.80	6.79
Humin N	0.0088	0.0079	3.28	3.18	3.23
Cystine N[d]	0.0052	0.0048	1.93	1.93	1.93
Arginine N	0.0777	0.0720	28.85	28.92	28.88
Histidine N	0.0074	0.0066	2.75	2.68	2.72
Lysine N	0.0139	0.0132	5.17	5.31	5.24
Amino N of filtrate	0.1054	0.0998	39.23	40.06	39.64
Non-amino N of filtrate	0.0392	0.0314	12.73	12.61	12.67
Recovered N	0.2708	0.2526	100.71	101.49	

[a] Nitrogen figures are corrected for the solubilities of the phospho-tungstates of the basic amino-acids.
[b] 2.2059 gm. protein. Ash- and moisture-free.
[c] 2.0164 gm. protein. Ash- and moisture-free.
[d] Calculated from cystine by the Tompsett modification of the Folin and Marenzi method.

Table 2

NITROGEN DISTRIBUTION OF SCLERAL GELATIN AS DETERMINED BY THE VAN SLYKE METHOD[a]

Nitrogen	Preparation		Preparation		Average
	I[b]	II[c]	I	II	
	grams	grams	percent	percent	percent
Total N	0.3444	0.3444	17.20	17.20	17.20
Amide N	0.0097	0.0099	2.81	2.87	2.84
Humin N	0.0013	0.0013	0.37	0.37	0.37
Cystine N[d]	0.0015	0.0015	0.38	0.38	0.38
Arginine N	0.0536	0.0530	15.56	15.54	15.55
Histidine N	0.0161	0.0153	4.67	4.44	4.56
Lysine N	0.0244	0.0240	7.08	7.00	7.04
Amino N of filtrate	0.1885	0.1897	54.73	55.81	55.27
Non-amino N of filtrate	0.0508	0.0508	14.75	14.75	14.75
Recovered N	0.3459	0.3453	100.35	100.35	

[a] Nitrogen figures are corrected for the solubilities of the phospho-tungstates of the basic amino-acids.
[b] 2.0023 gm. protein. Ash- and moisture-free.
[c] 2.0023 gm. protein. Ash- and moisture-free.
[d] Calculated from the colorimetric method of Tompsett.

Table 3

NITROGEN DISTRIBUTION OF SCLERAL ELASTIN AS DETERMINED BY THE VAN SLYKE METHOD[a]

Nitrogen	Preparation		Preparation		Average
	I[b]	II[c]	I	II	
	grams	grams	percent	percent	percent
Total N	0.2268	0.2919	12.87	12.99	12.93
Amide N	0.0156	0.0211	6.87	7.22	7.05
Humin N	0.0041	0.0048	1.80	1.64	1.72
Cystine N[d]	0.0000	0.0000	0.00	0.00	0.00
Arginine N	0.598	0.0736	26.36	26.25	26.31
Histidine N	0.0012	0.0023	0.52	0.52	0.65
Lysine N	0.0193	0.0241	8.50	8.50	8.39
Amino N of filtrate	0.1153	0.1530	50.83	50.83	51.62
Non-amino N of filtrate	0.0107	0.0139	4.71	4.71	4.74
Recovered N	0.2260	0.2928	99.59	99.59	

[a] Nitrogen figures are corrected for the solubilities of the phospho-tungstates of the basic amino-acids.
[b] 1.7618 gm. protein. Ash- and moisture-free.
[c] 2.2458 gm. protein. Ash- and moisture-free.
[d] Calculated from cystine by the Tompsett modification of the Folin and Marenzi method.

Table 4

DISTRIBUTION OF NITROGEN IN SCLERAL MUCOID, GELATIN, AND ELASTIN AS CALCULATED FROM THE VAN SLYKE ANALYSIS IN TERMS OF PERCENT OF THE PROTEIN

Nitrogen	Protein		
	Mucoid	Gelatin	Elastin
	Average percent	Average percent	Average percent
Amide	0.82	0.48	0.91
Humin	0.38	0.06	0.22
Basic	4.76	4.77	4.50
Non-Basic	6.41	12.00	7.29
Total	12.36	17.31	12.92

basic amino-acids, dicarboxylic acids, tryptophane, cystine, lysine, and tyrosine is low, and the content of mono-amino-acids high. The values of the basic amino-acids are not in agreement with those of Jess[3]. The method which he used gives rough quantitative results which can not be compared with those in the appended table. The difference between the amounts of amino-acids found by isolation and those found by the above method may lie in the tendency for cystine and proline to be precipitated by the phosphotungstic acid with the basic amino-acids. Lysine thus frequently gives low values by the isolation technic[14]. In contrast to corneal gelatin, the percentages of basic amino-acids as reported in scleral gelatin[3] differ somewhat with published analyses of gelatin derived from other bovine collagens. There is evidence that there are two or more kinds of collagen in the same tissue[13]. However, it is not to be expected that the analyses of scleral gelatin would be the same as those of other gelatin except in a general way.

Sclera, like all connective tissue, consists not only of white fibers, but also of yellow elastic fibers. The latter are formed of the protein elastin, which, like collagen, is to be considered as an inert substance metabolically. Constitutionally, scleral elastin is like collagen, as shown by tables 3, 4, and 5. The cystine and tryptophane content is remarkably low. Elastin consists chiefly of mono-amino-acids. Here too, it must be remembered that there is probably more than one elastin present in the same tissue.

Table 5

DISTRIBUTION OF AMINO-ACIDS IN SCLERAL MUCOID, GELATIN, AND ELASTIN AS CALCULATED FROM THE VAN SLYKE ANALYSIS IN TERMS OF PERCENT OF THE PROTEIN[a]

Amino-acid	Protein		
	Mucoid	Gelatin	Elastin
	average percent	average percent	average percent
Arginine[b]	11.12	8.33	10.56
Histidine[b]	1.23	2.96	0.23
Lysine[b]	3.30	6.38	5.74
Cystine[c]	2.11	0.67	0.00
Cystine[e]		0.30	
Tryptophane[d]	0.75	0.07	0.22
Tyrosine[d]	6.17	0.90	2.35

[a] Calculated on an ash- and water-free protein.
[b] Percentages calculated from the average results of duplicate analyses by the Van Slyke method.
[c] Determined by the Folin and Marenzi method as modified by Tompsett.
[d] Determined by the colorimetric method of Folin and Marenzi.
[e] Determined by the colorimetric method of Sullivan.

In the interpretation of tables 2, 3, and 4 the data must be considered as comparable but not absolute.

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References

[1] Mörner, C. T. Untersuchung der Proteïnsubstanzen in lichtbrechenden Medien des Auges. II. Ztschr. f. physiol. Chem., 1894, v. 18, p. 213.
[2] Krause, A. C. The chemical constitution of the sclera. Arch. of Ophth., 1932, v. 7, p. 598.
[3] Jess, A. Zur vergleichenden Chemie der Hornhaut und der Lederhaut des Auges. Arch. f. Ophth., 1923, v. 112, p. 489.
[4] Van Slyke, D. D. The analyses of protein by determination of the chemical group characteristics of the different amino-acids. Jour. Biol. Chem., 1911-1912, v. 10, p. 15.

[8] Koehler, A. E. Modification of the Van Slyke method for determining arginine. Jour. Biol. Chem., 1920, v. 42, p. 267.
[9] Van Slyke, D. D. Improvements in the method for analysis of proteins by determination of chemical group characteristics of the different amino-acids. Jour. Biol. Chem., 1915, v. 22, p. 281.
[7] Folin, O. and Marenzi, A. D. Tyrosine and tryptophane determinations in one-tenth gram of protein. Jour. Biol. Chem., 1929, v. 83, p. 89.
[6] Tompsett, S. L. A note on the determination of cystine in proteins by the method of Folin and Marenzi. Biochem. Jour., 1931, v. 25, p. 2014.
[5] Sullivan, M. X. A distinctive test for cystine. Pub. Health Rep., U.S.P.H.S., 1926, v. 41, p. 1030.
[10] Folin, O. and Marenzi, A. D. An improved colorimetric method for the determination of cystine in proteins. Jour. Biol. Chem., 1929, v. 83, p. 103.
[11] Levene, P. A. Hexosamines and mucoproteins. London, Longmans, Green & Co., 1925.
[12] Block, R. J. and Vickery, H. B. The basic amino-acids of proteins. A chemical relationship between various keratins. Jour. Biol. Chem., 1931, v. 93, p. 113.
[13] Knaggs, J. Studies on collagen. The change which collagen undergoes when treated with solutions of hydrochloric acid and sodium hydroxide. Biochem. Jour., 1929, v. 23, p. 1308.
[14] Gortner, R. A. and Sandstrom, W. M. Proline and tryptophane as factors influencing the accuracy of Van Slyke's method for the determination of nitrogen distribution in proteins. Jour. Amer. Chem. Soc., 1925, v. 47, p. 1663.

RESULTS OF RECENT INVESTIGATIONS IN THE ETIOLOGY OF TRACHOMA

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The recent literature on this subject is evaluated under the headings, Inclusion bodies, Nutritional and constitutional aspects, Bacteriological aspects, Filtrability, and Allergy, the last named being a new factor under investigation at the Oscar Johnson Institute. Presented in part at the Academy of Ophthalmology and Oto-Laryngology in Montreal, Canada, September 21, 1932, under the title, "Recent developments in trachoma investigations". From the Department of Ophthalmology, Washington University, Saint Louis.

In a previous paper[1] an attempt was made to clarify the diagnosis* of trachoma, particularly in the early stage, in the light of recent study and literature. The object of this paper is to set down the results of recent investigations of competent research workers and clinicians in the etiology of trachoma. In order better to evaluate the etiological studies it is first necessary to summarize our present knowledge regarding the infectivity and the transmissibility of trachoma with a brief reference to certain epidemiological points of view.

* I desire to correct a possible misunderstanding of a statement in that previous paper. Where I state that "pannus is therefore recognized as absolutely pathognomonic of trachoma", I refer to its importance when associated with other symptoms of trachoma which taken alone are not sufficient to warrant one in making a diagnosis. I recognize that a pannus may result from other things, as, for example, from an allergy alone.

Infectivity, transmissibility and epidemiology

In spite of all the variations in the clinical picture, Heymann and Rohrschneider[2] emphasize that trachoma is a disease of distinctive character, whose infectivity has been unquestionably certified as a result of epidemiological experience and experimental investigations. Noguchi[3] states that "the only reliable knowledge we possess regarding the inciting agent of trachoma is that it occurs in trachomatous lesions and is capable of being transmitted to certain species of animals".

There are many cases on record of accidental and experimental transmission of trachoma to human beings. One

classic example should suffice. Professor Ernst Fuchs once told me that while one of his assistants was operating upon a trachomatous patient some of the secretion was discharged into one of his eyes. The assistant ran into the adjoining room where Fuchs immediately treated him so vigorously and thoroughly with a solution of two-percent silver nitrate that there followed an intense and distressing reaction. In spite of this, the assistant succumbed acutely to the disease in less than a week, and treatment was at once instituted. The other eye eventually became involved, pannus and scar tissue developed, and treatment was continued for more than two years before the disease became inactive. The term "inactive" is certainly the proper one to use rather than the word "cured" in cases of trachoma. I quite agree with Cohen[4] and Wilson[5] when they state that trachoma is practically an incurable disease, and also with Davis's[6] declaration that "a quick cure of a conjunctival condition diagnosed and treated as trachoma is almost a guarantee of a mistaken diagnosis". Furthermore, the failure of the silver nitrate solution to prevent such an infection as that related by Fuchs and confirmed by the experience of others (Lindner and Axenfeld) makes us feel that possibly the virus of trachoma is resistant to silver nitrate. Heymann and Rohrschneider[2] draw an analogy when they speak of the failure of Credé's method to prevent inclusion blennorrhea, while it is most effective against gonococci.

It is significant that in nearly all cases of accidental and experimental transmission of trachoma the disease begins with acute or subacute symptoms, whereas most of the textbook descriptions refer to it as an affection whose onset is insidious. Various explanations have been offered regarding this seeming disagreement. Some have suggested that the acute symptoms are always caused by a mixed infection, but this opinion now seems to be largely discredited. Some believe that the massive inoculation generally received in accidental and experimental cases as against the probably slight inoculation, often by dried and supposedly attenuated virus, that occurs in the so-called insidious cases, accounts for the different types of onset; others that the presumably insidious cases, begin more or less acutely but since the acute stage is almost always followed by a period of relative quiescence for several months before the symptoms slowly reappear, the relation between the acute beginning and the insidious return of the disease is not associated (Taborisky[7]). It would, therefore, be justifiable to conclude that although trachoma perhaps is an insidiously beginning disease in the majority of cases, there is such a thing as acute trachoma which develops without any evidence of a mixed infection with pathogenic bacteria (Blatt[8]).

The period of incubation of trachoma ranges from five to twelve days, with the majority of cases showing the first signs in about a week. It should be added that the period of incubation is the same in inclusion blennorrhea, a disease whose infectivity has also been definitely established. In fact it is probably highly contagious, while trachoma, on the other hand, is considered by most authorities to be only mildly contagious (Cohen[4]). Inclusion blennorrhea of the newborn has been experimentally transmitted to adults by several investigators. The disease begins acutely and remains acute for a month or six weeks after which it slowly recedes over a period of several months to a year or more, finally healing without pannus and generally without scar-tissue formation. According to Heymann and Rohrschneider[2], Lindner, Siegrist, Wolfrum and others have reported the frequent finding of fine scarring in the conjunctiva of healed cases. Taborisky[7] says that the cicatrization is sometimes severe. Heymann and Rohrschneider[2] state that the inoculation of baboons with material from cases of inclusion blennorrhea is practically 100 percent positive which is quite a contrast to the low percentage of positive inoculations with trachomatous material. All in all, therefore, it is difficult to subscribe to the theory that inclusion blennorrhea and trachoma are one and the same disease, or that inclusion blennorrhea is

etiologically a genital trachoma as was suggested by Lindner[9] and the writer[10] several years ago. Although their beginnings may often be alike, they certainly terminate differently.

The question of monocular trachoma has brought forth a great deal of discussion, some of it quite recent. There are too many cases recorded by competent observers to deny the existence of such an affection. I have seen a number of such cases myself, the last one in our clinic in St. Louis about a month ago. In this young man who had been suffering with the disease for two years, one eye was seriously involved with a diffuse subepithelial infiltration, papillo-follicular hyperplasia, intense pannus, and considerable scar tissue formation. He had photophobia and hemiptosis of this eye but no discharge. The other eye which was examined minutely with the slitlamp, was absolutely normal. What is the explanation and what are the experimental data regarding such cases?

Several investigators have endeavored to infect the normal eye with material from the infected eye, but their results have almost always been negative. They have also inoculated other individuals with the same material, but again with negative results. They have then inoculated the normal eye of the monocular trachomatous case with material from binocular cases of trachoma in various stages. With material taken from fresh cases they invariably produced the disease in the normal eye as in normal control cases. However, material taken from chronic cases generally did not reproduce the disease. All this tends to the conclusion that trachoma is probably communicable for only a short period in the early stages. If so, as Roche[11] points out, trachoma would not differ from other contagious diseases. This hypothesis would not only explain monocular trachoma, but also the irregular results of inoculations of both human subjects and experimental animals. It would also explain how one member of a family might have trachoma for years while other members of the family remained free.

It has also been observed by several ophthalmologists that many cases of apparently monocular trachoma are not monocular at all when the "good" eye is examined carefully with the slitlamp. Mossman[12] recently saw pannus as the only sign of trachoma in the "normal" eye of a man with supposedly monocular trachoma. Such evidence strongly supports the theory of a delayed or late infection of the second eye, with either a diminished virulence of the infective agent, or a partial immunity in the host by the time that eye became inoculated. Heymann and Rohrschneider[2] believe that it is the virulence of the material that is the chief factor in successful inoculations, but they also emphasize the fact that such material must not be taken from later stages of the disease.

According to Krumbach[13], individual differences in receptivity to infection are apparent in trachoma, as they are in many other infectious diseases. This, of course, would not at all explain monocular trachoma and the absence of the disease in many families of children whose mothers had been seriously affected for years. Regarding this matter of receptivity it is well to recall the fact that full-blooded negroes are immune or practically immune to trachoma. In the few cases of negroes who have been reported as having trachoma, the possibility of their having mixed blood would be the easiest explanation.

Consistent with the fact of the well-known immunity of the negro to trachoma I have on a number of occasions during the past few years referred to a possible relationship between the amount of pigment in the skin of individuals and races on the one hand, and relative immunity to trachoma or the degree of infection on the other. Generally speaking, my observation has been that the lighter complexioned the individual, the severer the symptoms, and the darker the individual, the milder the symptoms. Many exceptions may possibly be cited to discredit this hypothesis, but if we consider the effects of trachoma among large groups, perhaps among races, I believe that the principle suggested will hold good. For example, the severest form of trachoma that I have ever seen is that affecting the

mountain whites in the Ozarks of Missouri. These people are mostly the fair-haired descendants of early American settlers of Nordic extraction, chiefly English and Scotch. Rice and Smith[14] of the U. S. Public Health Service estimate that 3.9 percent of the 17,000 active and inactive cases of trachoma in the State of Missouri are blind under the present legislative definition of blindness, which is limited to those not having vision better than an ability to see hand motions at one foot—admittedly a very severe standard. They found 12.5 percent with vision as low as 20/200 (industrial blindness) or worse.

Let us now take an example of a darker-skinned race. In 1927, I[15] made an estimate, based upon observations in different parts of China and data secured from certain records, books, and governmental officials, that there were approximately two million blind Chinese, about half of whom were made blind by trachoma. I further estimated that there were probably one-hundred million Chinese with trachoma, calculated upon an incidence of twenty-five percent of the population. On this basis, therefore, about one percent of those afflicted with trachoma in China become blind. I should add that approximately the same definition of blindness was employed as that used in Missouri. A comparison of the figures show that about four times as much blindness results from trachoma among the whites of the Ozarks as among the Chinese. Judging from my own observations in Japan and from published reports, the disease in that country seems to be more severe there than it is in China but not as virulent as it is in the Ozarks. It is also more severe in India and in Egypt than it is in China, and much worse in Southern Europe. Its devastating effects are approximately the same among the American Indians as among the Chinese.

Based therefore largely upon my own observations, which I must admit are in no sense complete, I would place the races in the following order according to the severity of the symptoms and the sequelae of trachoma: 1. American whites as typified by the people living in the mountains of Missouri, Kentucky, and Tennessee, 2. peoples of Southern Europe, 3. Japanese, Egyptians, and natives of India, 4. Chinese, and American Indians, 5. mixed-blooded negroes, 6. full-blooded negroes —supposedly immune.

If this hypothesis be correct, and I should emphasize that it is only an hypothesis, it is possible that the amount of pigment in the skin and the conjunctiva is the important factor in immunity or in susceptibility to trachoma. If so it does not seem unreasonable to suggest the therapeutic use of pigment inoculations in trachoma. A recent article by Testu[16] suggests inoculating the blood of negroes as a treatment of trachoma.

Etiology

The etiology of trachoma still remains obscure despite the continued, painstaking researches of numerous investigators of the past two generations. So obscure, in fact, is the causative agent that opinion is still divided as to whether trachoma is an infection, or whether it is a virus disease, or a disease of nutritional deficiency, or even an allergy. While the balance of the evidence strongly indicates that trachoma is communicable and probably arises from a bacterial origin, it must be admitted that this concept is not universally accepted. It may be well therefore to summarize the latest work and opinions and state the position of each etiologic theory at the present time.

A. Inclusion bodies. No discussion of trachoma would be complete without reference to the inclusion bodies of Prowazek - Halberstaedter[17]. Twenty-five years have elapsed since these authors announced their discovery, and still no conclusive evidence has been advanced to prove or to disprove them as the cause of trachoma.

Although we lack sufficient proof that the Prowazek - Halberstaedter bodies have a living independent nature, it has been proved, according to Heymann and Rohrschneider[2], that they are not mutational forms of gonococci or other hemoglobinophilic organisms as was contended twenty years ago by

Williams[18] and others. Commenting also on Lindner's[9] theory that inclusion blennorrhea is a genital trachoma, these authors do not believe that proof is sufficient for considering the virus of inclusion blennorrhea identical with trachomatous virus in spite of certain cross-immunity experiments done by Lindner.

The question of "trachoma bodies" cannot be dismissed on the assumption that they are identical with the epithelial-cell inclusions induced by such irritants as nicotine, croton oil, etc., as recently reported by Gifford and Lazar[19]. In our laboratory James and the writer were able to produce epithelial-cell inclusions in rabbits with the irritants mentioned above and with a number of others, but both morphologically and in their staining reactions they differed from trachoma bodies. They never took the deep-blue stain of the inclusion bodies in trachoma, but were usually purplish in color. Furthermore, they appeared to be an extruded or split-off part of the cell nucleus. An examination of Gifford's and Lazar's photomicrographs and colored drawings on page 474 of their article shows the nuclear splitting in cells from their rabbits with artificially induced conjunctivitis, in contrast to the apparently whole nuclei shown on the same page to illustrate the inclusion bodies in inclusion blennorrhea.

Several investigators have demonstrated that certain irritants bring about a rapid increase in the chromatin of the nucleus in consequence of which the cell, in its effort to balance the nucleocytoplasmic tension ratio, is forced to extrude nuclear material into the cytoplasm. Horning and Miller[20] in their studies of cancer cells, show all stages of nuclear constrictions up to a complete splitting of the achromatic nucleus into two closely approximate halves. An analogy to the effects of irritants on the conjunctiva might be referred to in the contribution of Walker[21] who, when working upon artefacts as a guide to the chemistry of the cell, attempted to demonstrate that the Golgi bodies and mitochondria were artefacts because he could produce by chemical means cellular structures having a similar morphology. His conclusions have already been entirely refuted.

There are certain authors who suggest that the inclusions of trachoma and other diseases may be morphologically alike but that they may be biologically different. Taborisky[7] thinks that these all belong in a related group like the variations of the dysentery bacillus, which are differentiated only by their biological reactions. Animal experimentation has thus far failed to solve this problem. Horning[22] suggests that by the use of the new method of microincineration of tissues a specific biological difference might be demonstrated. If one found a difference in the inorganic structures he could assume a difference in the organic constitution. This method could also be applied to determining whether the inclusions produced in epithelial cells by the use of chemicals are biologically related to trachoma inclusions.

A recent statement by Wolchonsky[23] epitomizes the present situation regarding these bodies in a very fair and justifiable manner: "Although the etiological significance of inclusion bodies for trachoma is still disputed and perhaps doubted by more and more, their diagnostic value still remains almost undoubted."

B. Nutritional and constitutional aspects. It has been suggested by certain ophthalmologists that trachoma is a disease of nutritional insufficiency. This hypothesis has been based almost entirely upon the clinical observation that the races and individuals affected are chiefly those living in relative poverty and squalor, and accustomed to a low standard of living. Experimental work to shed light on this possibility has only recently been undertaken, and it is therefore impossible to make a statement with positive assurance.

From experiments conducted in Noguchi's laboratory on the effect of vitamin-A deficiency in monkeys, Miss Tilden[24] concluded that there was no relationship between trachoma and lack of this vitamin. Later Kendall and Gifford[25] reported that rats and guinea pigs rendered vitamin-A deficient, were not

susceptible to conjunctival infection with Bacterium granulosis. As far as we know these are the only references on this subject, and in both instances, the experiments are not entirely satisfactory because the animals died too soon either of tuberculosis or from too great a depletion of vitamin A. Further work is necessary before this possibility is exhausted. Experiments bearing on nutritional deficiency as an underlying factor in trachoma are being conducted by Dr. Rossleene Hetler in our laboratory, but her work is still too incomplete to allow of any conclusions.

An attempt has been made to study this subject clinically by maintaining patients on a balanced diet including plenty of cod liver oil. Dr. Rice[26] of the U. S. Public Health Service has been conducting such a study at Rolla, Missouri, and at Richmond, Kentucky. Patients have been kept on a diet for six weeks during which time one eye is treated and the other allowed to go untreated. Dr. Rice's impression from these initial experiments is that no improvement has been shown in the untreated eye.

The observation frequently made regarding the high incidence of trachoma among the professional wrestlers of Europe and America certainly casts serious doubt upon the theory of trachoma being a dietary deficiency disease, for this group of athletes obviously has as substantial a diet as any group in the world.

The connection which Angelucci[27] tries to establish between trachoma and lymphatic diathesis is not confirmed by the experience of MacCallan[28] who declares that "neither defective diet nor a depressed physical condition including the so-called adenoidism, is an essential factor in the process of trachomatous infection. It is usually accepted that any depressed physical condition presents a more favorable culture medium for the infective principle of contagious disease than perfect health. It may be concluded therefore that this may be the case with trachomatous infection of the eye and its appendages." Boldt, Cirkovski, et al.[29] found that 97.6 percent of trachoma cases examined by them had normal constitutions and conclude that there is no constitutional difference between the trachomatous and nontrachomatous.

Pascheff[30] takes the opposite point of view along with several others when he states his belief that trachoma is not an exogenous parasitic disease, but rather an endogenous constitutional disease characterized by lymphatic-adenoid vegetations of the conjunctiva and cornea with follicular formation that is not a mere inflammatory lymphatic infiltration.

Cattaneo[31] examined very carefully over two hundred trachomatous children and about the same number who were trachoma free, all of whom lived in the same neighborhood and had encountered an equal opportunity to become infected. He found that although both groups showed a lymph-adenoid constitution, the trachomatous showed a somewhat higher degree of involvement. He concludes that lymphatism and adenoidism mark the whole constitution with their imprints and increase the susceptibility to trachomatous infection.

Those who consider a lymph-adenoid diathesis as the basis for certain follicular affections must be somewhat disconcerted by the statement of several investigators to the effect that folliculosis is an infectious process that can be transmitted not only to humans but to animals. Axenfeld[32] reports having infected himself with folliculosis and Nicolle[33] concludes from the results of his own experiments that the affection is transmissible. Lindner inoculated himself with an organism, alleged to be Bacterium granulosis, obtained from a case of folliculosis by Rieger[34]. The inoculation produced a mild folliculosis that persisted for a year before it disappeared.

Several Italian workers take other points of view from those expressed above. For example, Calendoli[35] cites cases in an attempt to show that many trachomatous affections point to manifest or hidden endocrine disturbances. Bardanzellu and Trovati[36] have come to the conclusion that the trachomatous nodules and papillae of the conjunctiva

are closely related to if not identical with the toxico-infective tuberculous granulomas and may be explained on the same basis. I cannot reconcile such a conclusion with the fact that the negro who is exceedingly susceptible to tuberculosis is immune, or practically so, to trachoma.

C. Bacteriological aspects. The original bacteriological researches in trachoma were made by Robert Koch after the eminent successes he had achieved in the study of other diseases. He discovered almost simultaneously with Weeks what is now commonly known as the Koch-Weeks bacillus, but which appears to be present only accidentally in trachoma. Since Koch's time numerous bacteria have been advanced as the cause of trachoma by different workers, but in no instance has the evidence offered in support of these organisms been found conclusive or convincing. More recently Noguchi[3] discovered in American Indians suffering from trachoma a new species which he called Bacterium granulosis and attributed to it a causal relationship to the disease. His reasons for accepting Bacterium granulosis were (1) the frequency of isolation of this bacterium in trachomatous cases, and (2) the appearance of follicular conjunctivitis in monkeys following intraconjunctival injections of this organism. While ophthalmologists examining Noguchi's monkeys were not in accord as to whether the conjunctival changes could be regarded as trachoma, nevertheless Bacterium granulosis immediately became the most tangible and promising of the bacteria isolated as the possible cause of trachoma. It must be remembered that up to the present time this organism is the only bacterium that has been shown capable of inducing a follicular change in the conjunctiva of the monkey and chimpanzee. Prior to Noguchi's experiments, the only transfers to laboratory animals were accomplished by inoculation of whole material or, as Nicolle[33] reported, by filtered material, and even in these instances there is no evidence that corneal involvement occurred in the animals used for injection.

Noguchi's work has been taken over by Olitsky[37] and his associates at the Rockefeller Institute, and their results not only support Noguchi's original observations but show in addition that secondary infection superimposed upon experimental infection by Bacterium granulosis induces a severer form of granular conjunctivitis, which more closely simulates human trachoma. They have found also that intracorneal injections of Bacterium granulosis does stimulate the formation of a "nebulovascularization of the cornea", but it must be stated that the illustrations they present do not show the vascularization to be typical of the pannus occurring in human trachoma.

Noguchi's discovery stimulated renewed investigations of trachoma. While occasional reports have confirmed the isolation of Bacterium granulosis the balance of the work has disclosed a complete absence of this organism in trachoma. On the other hand Bacterium granulosis is reported to have been isolated by some from folliculosis, and as already pointed out is considered by Lindner and Rieger[34] to be a cause of follicular conjunctivitis. Animal inoculations with Bacterium granulosis have in general, but not in their entirety, been disappointing. Attempts have been made by some investigators to induce trachoma in human subjects by injections of Bacterium granulosis but except for one reference the results have been flatly negative. The instance of positive transfer was reported by Addario[38] whose work with one volunteer is not clear or convincing.

In our own laboratory, attempts by Julianelle and Harrison to isolate Bacterium granulosis from patients in Missouri, Kentucky, Tennessee, Georgia, and Oklahoma have been unsuccessful. Attempts to transmit trachoma to monkeys by injections of Bacterium granulosis have also been quite inconclusive. Moreover, Weiss was unable to induce trachoma by injections of Bacterium granulosis in three human volunteers while studying material in Tunis.

The argument, therefore, in favor of Bacterium granulosis does not seem very strong when we remind ourselves of just two things: first, that trachoma

is rather readily transmitted among humans in whom it often begins with acute symptoms and almost without exception ends in scar tissue formation and corneal changes, but is very difficult if at all possible to transmit to monkeys; second, that Bacterium granulosis occasionally produces a granular conjunctivitis and in rare instances cicatricial tissue in monkeys, but does not produce in humans even a granular conjunctivitis to say nothing about scar tissue and pannus, which are the characteristic signs of human trachoma.

If we may summarize, therefore, the results of the bacteriological investigations of trachoma, it may be said that while a number of bacteria have been offered by different investigators as the cause of trachoma, sufficiently conclusive proof has not been submitted in support of these organisms. The possibility of Bacterium granulosis* as the etiological agent must still hang in the balance until further studies have been pursued. The experiments undertaken are complicated by the lack of corneal changes following intraconjunctival injections of Bacterium granulosis. Whether this fact is an inherent incapability of the organism, or whether the experimental animal is unsuited for the transfer of trachoma still remains unknown.

D. Filtrability. That trachoma may be due to a filtrable agent was first reported from Nicolle's[33] laboratory. The experiments undertaken there revealed that the bacteriological filtrates of human trachomatous material contained an agent capable of transmitting trachoma. Since the publication of those experiments other workers have pursued similar experiments with conflicting results, so that it is impossible to say whether or not the causative agent of trachoma is a filtrable virus. It must be remembered in this connection that Olitsky[39] and his co-workers have shown that Bacterium granulosis is filtrable under certain conditions and that follicular monkey tissue as a result of injections of Bacterium granulosis may yield infective filtrates. More recent work on the filtrability of bacteria under different conditions show that bacteria may permeate bacterial filters, thus rendering filtrability an insufficient proof of the presence of a virus in filtrates. The properties attributed by Nicolle to the filtrable agent he describes makes his virus an unusual one.

More recently it has been suggested by several investigators that trachoma is an example of associated infection. This concept holds that a filtrable virus initiates the disease, and subsequently secondary organisms prolong and complicate the disease. While this is an entertaining hypothesis there is no experimental evidence to support it. It is possible that an early acute stage, following a short incubation period as sometimes described in trachoma, may be incited by a filtrable virus and that the more chronic and slowly progressive phase of the disease may be aided and abetted by secondary invading bacteria, but only future investigations can reveal the correctness of this hypothesis.

E. Allergy. Recent studies conducted by Julianelle and Morris[40] in our laboratories suggest the possibility that vascularity of the cornea may be a response to hypersensitiveness. Thus it has been shown that accompanying direct sensitization of the cornea to various bacteria isolated from the conjunctiva of patients suffering from trachoma, the eye undergoes marked changes. The conjunctival vessels are injected, the cornea becomes clouded and later there appears a vascularization over the limbus. The vascularization, beginning as small twiglike vessels, later forms definite anastomosing loops which eventually descend over the cornea as a curtain of single vessels terminating in crow-foot or brushlike processes. It is

* Since going to press, the able review of Dr. Bengtson[41] on the relation of Bacterium granulosis to trachoma has been published. Her analysis of the literature shows that of twenty-three investigators attempting to isolate Bacterium granulosis in trachoma, only six offer reasonable evidence to show the successful isolation of this organism. Moreover she herself cultured material from seventy-three cases of trachoma representing perhaps the greatest single geographic distribution of material to date, without a single isolation of Bacterium granulosis.

possible to maintain vascularization indefinitely under these conditions.

That this reaction is essentially one of bacterial hypersensitiveness rather than infection is evidenced by the fact that similar changes accompany direct sensitization of the cornea to purified crystalline egg albumen. While it is not clear that in trachoma a similar mechanism is involved, the experiments are suggestive.

20 Crestwood drive.

References

[1] Howard, H. J. The diagnosis of trachoma. Amer. Jour. Ophth., 1933, v. 16, no. 2.
[2] Heymann, B. and Rohrschneider, W. Trachoma and other inclusion diseases of the eye. Handb. d. path. Mikroorg., 1930, v. 3, pp. 997-1030.
[3] Noguchi, H. The etiology of trachoma. Jour. Exper. Med., 1928, v. 48, no. 2, suppl. 2.
[4] Cohen, M. Discussion on trachoma at 12th Ann. Conf. Nat'l. Comm. for Prevent. Blindness, 1926.
[5] Wilson, R. P. Ophthalmia Aegyptiaca. Amer. Jour. Ophth., 1932, v. 15, pp. 397-406.
[6] Davis, H. B. Trachoma. Abst. in Program of Kansas City Soc. Ophth. and Otol., Dec. 17, 1931.
[7] Taborisky, J. The Prowazek-Halberstaedter bodies and their clinical significance. Arch. f. Ophth., 1930, v. 124, pp. 455-485.
[8] Blatt, N. On the unitarian and dualistic concepts of trachoma in daily practice, in trachoma statistics, and in trachoma prophylaxis. Arch. f. Ophth., 1931, v. 127, p. 432.
[9] Lindner, K. Gibt es ein genitales Trachom? Wien. med. Wchnschr., 1925, v. 75, pp. 2488-2491.
[10] Howard, H. J. The role of the epithelial cell in conjunctival and corneal infections. Amer. Jour. Ophth., 1924, v. 7, pp. 909-936; Trans. Amer. Ophth., Soc., 1924, v. 22, pp. 186-244.
[11] Roche, C. Klinische Studien über die Uebertragungsart des Trachoms. Abst. by Hamann in Zentralbl. f. d. ges. Ophth., 1930, v. 22, p. 776.
[12] Mossman, Paul D. Personal communication, Sept. 3, 1932.
[13] Krumbach, H. Change of views on trachoma. Klin. Wchnschr., 1926, v. 5, p. 129.
[14] Rice, C. E. and Smith, J. E. Trachoma in Missouri. Jour. Mo. State Med. Ass'n, 1932, Jan., p. 13.
[15] Howard, H. J. Community control of trachoma in China. China Med. Jour., 1927, v. 41, pp. 765-769.
[16] Testu, U. The cure of trachoma with the blood of negroes. Abst. in Zentralbl. f. d. ges. Ophth., 1931, v. 25, p. 411.
[17] Halberstaedter, L. and v. Prowazek, S. Zur Aetiologie des Trachoms. Deutsche med. Wchnschr., 1907, v. 33, p. 1285.
[18] Williams, A. W. A study of trachoma and allied conditions in the public school children of New York City. Collected Studies from the Bur. of Lab., Dept. of Health, New York City, 1912-13, v. 7, pp. 159-247.
[19] Gifford, S. R. and Lazar, N. K. Inclusion bodies in artificially induced conjunctivitis. Arch. of Ophth., 1930, v. 4, pp. 468-475.
[20] Horning, E. S. and Miller, I. D. Chromidial extrusion, and its relationship to atypical nuclear phenomena in tumour cells. Australian Jour. Exper. Biol. and Med. Sc., 1930, v. 7, pp. 151-160.
[21] Walker, C. E. Artefacts as a guide to the chemistry of the cell. Proc. Roy. Soc., Series B., 1928, v. 103, pp. 397-403.
[22] Horning, E. S. Personal communication, Aug. 30, 1932.
[23] Wolchonsky, S. Prowazek's Körperchen bei Trachom. Klin. Monatsbl. f. Augenh., 1930, v. 84, p. 544.
[24] Tilden, E. B. and Miller, E. G. Response of monkeys to the withdrawal of vitamin A from diet. Jour. of Nutri., 1930, v. 3, p. 121.
[25] Kendall, A. I. and Gifford, S. R. Trachoma and avitaminosis. Arch. of Ophth., 1930, v. 4, pp. 322-325.
[26] Rice, C. E. Personal communication, Aug. 23, 1932.
[27] Angelucci, A. Sull' azione biologica del siero degli adenoidei tracomatosi. Arch. di Ottal., 1925, v. 32, pp. 289-311.
[28] MacCallan, A. F. Diet deficiency and trachoma. Brit. Jour. Ophth., 1932, v. 16, p. 124.
[29] Boldt, Cirkovski, et al. Trachom als Volks- und Heereskrankheit. Bibliothek von Coler, 1903, v. 19.
[30] Pascheff, C. Chronic hyperplasia of the conjunctiva and true trachoma: Memoires originaux. Arch. d'Opht., 1930, v. 47, pp. 821-832.
[31] Cattaneo, D. Trachoma and constitution. Studi. Sassar II, 1931, v. 9, pp. 169-194.
[32] Axenfeld, T. Die Aetiologie des Trachoms, Jena, 1914.
[33] Nicolle, C., Cuénod, A., and Blaizot, L. Etude expérimentale du trachome. Arch. de l'Inst. Pasteur de Tunis, 1913, pts. 3-4, p. 157.

[34] Rieger, H. Zur Aetiologie der Folliculosis conjunctivae. Arch. f. Ophth., 1932, v. 128, pp. 310-324.
[35] Calendoli, S. Tracoma ed elemento endocrino-simpatico. Zentralbl. f. d. ges. Ophth., 1932, v. 26, p. 626.
[36] Bardanzellu, T. et Trovati, E. Ueber die klinischen Beziehungen zwischen Trachom und Tuberculose. Arch. di Ottal., 1931, v. 38, p. 621. (Abst. in Klin. Monatsbl. f. Augenh., 1932, v. 88, p. 411, and in Amer. Jour. Ophth., 1932, v. 15, p. 573.
[37] Olitsky, P. K. Relation of Bacterium granulosis to trachoma. Rev. internat. du Trachome, 1930, v. 7.
——, Knutti, R. E., and Tyler, J. R. Effect of secondary infection in experimental trachoma. Jour. Exper. Med., 1931, v. 54, p. 753.
——, Knutti, R. E. and Tyler, J. R. Transmission and cultivation experiments with human trachoma and the experimental disease in monkeys. Jour. Exper. Med., 1931, v. 54, pp. 31-40.
——, Knutti, R. E., and Tyler, J. R. Corneal reactions to Bacterium granulosis and other microorganisms. Jour. Exper. Med., 1932, v. 55, pp. 803-813.
Tilden, E. B., and Tyler, J. R. Bacterium granulosis in relation to trachoma: Its recovery from experimentally infected monkeys and from human trachoma. Jour. Exper. Med., 1930, v. 52, pp. 617-637.
——, and Tyler, J. R. Bacterium granulosis and trachoma. Science, 1930, v. 71, p. 186.
——, Dissociation of Bacterium granulosis Noguchi and identification of the organism by means of rabbit immune sera. Science, 1931, v. 73, p. 18.
Finnoff, W. C., and Thygeson, P. Bacterium granulosis. Arch. of Ophth., 1931, v. 5, p. 527.
Thygeson, P. Experimental granular conjunctivitis in monkeys induced by Bacterium granulosis. Amer. Jour. Ophth., 1932, v. 15, pp. 293-306.
[38] Addario, C. Role of Bacterium granulosis demonstrated in a case of experimental trachoma. Rev. internat. du Trachome, 1931, v. 8, p. 14.
[39] Olitsky, P. K., Knutti, R. E., and Tyler, J. R. The filtrability of Bacterium granulosis. Jour. Exper. Med., 1931, v. 54, pp. 557-565.
[40] Julianelle, L. A. and Morris, M. C. A study of pannus formation in the cornea of rabbits. Proc. Soc. Exper. Biol. & Med., 1932 (in press).
[41] Bengtson, Ida A. Discussion of Relationship of Bacterium granulosis to trachoma. U. S. Pub. Health Report, 1932, v. 47, p. 1914.

DETAILS OF CATARACT EXTRACTION

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These comments upon cataract extraction, as done at the Government Ophthalmic Hospital, Madras, were prepared by Col. Wright, the Superintendent of the Hospital, for the Annual Report of 1931.

Certain problems of cataract extraction of outstanding importance have demanded, and still demand, such extensive and careful investigation as almost to attain the dignity of research. What should be kept in mind when devising improvements is that they must be assimilable by the mass of operators, so that the general public benefits. As an example, in 1921, we were wide awake to the importance of facial akinesia. It was a major problem worthy of investigation.

In our report of 1922 we even expressed the opinion that a simple and effective method of blocking the seventh nerve would revolutionize cataract work in India.

We spent much time in dissection, and dealt with the seventh nerve in all situations from zygoma backwards. We were unsuccessful in paralyzing the main branch concerned, where it lies in the parotid over the neck of the jaw. We then explored a large series of skulls as to variations in the mastoid and stylomastoid region, and finding we could hit off the main trunk at the stylomastoid foramen with comparative ease, employed and enjoyed the great benefits of complete akinesia, which, however, was denied to others, who considered the method too complicated. It was left to O'Brien to perfect this idea, and to put a fool-proof method of obtaining this akinesia into the hands of all, no matter how timorous. The facial block, as perfected by him, has given to all cataract operators an invaluable addition to their technic, especially when dealing with unruly, uneducated patients.

There are certain outstanding points in connection with technic which have had our continued attention, since investigations in connection with muscular movement and pain have been effectively solved. Three such problems, one of which altogether relates to the capsulotomy procedure, have recently been reviewed in the light of our experience during the past three years:

1. The embarrassment due to blood entering the anterior chamber at the time of operation.
2. The certain attainment of a large central gap in the anterior capsule.
3. The method of securing the suction.

We cannot understand why some colleagues make light of the entry of blood into the anterior chamber at the time of operation. The older writers on cataract extraction were duly impressed by it. Of all our difficulties in the capsulotomy procedure, this is the greatest; and we have become very seriously affected by it only since putting the bridge flap on trial. It is such a drawback to this method that we have almost decided to abandon it, after a trial of over 2,000 cases. Some critics say that blood in the anterior chamber, in the absence of infection, matters not at all. We cannot take this point of view seriously. We consider that blood, plus cortex, is a mixture which is liable to give rise to the most troublesome of after-cataracts, quite apart from infection. Apparently a phacogenetic iritis is set up; and this, with a scaffolding of fibrin and cortex, causes the pupil to be bound down in part by fine synechiae to a dense capsular web with pigmented bands; a difficult after-cataract in which to make a nice aperture without unnecessary stirring up of vitreous and dragging on the ciliary body. Actually at the time of operation while we are yet performing the finishing touches, strands of fibrin form which adhere to iris and capsule, frequently extending into the section and under the bridge. These we feel compelled to pick out with the forceps, for, if we do not do

so, they set up adhesions, pull the pillars of the coloboma, or pupil border as the case may be, and form possible sites of leaks in the section which might otherwise be in absolute apposition. We believe that one reason why American and European operators do not stress the point more is that they operate on bloodless eyes, whilst it is the exception for us to do so.

It is curious that it is practically impossible to obtain a "white eye" with our average South Indian patient, such as one gets in Europeans. Apparently it is an essential difference between the Indian and European, possibly between the Mediterranean and Nordic types of eyes. We have so far been unable to overcome this difficulty by ordinary means; and have been driven to the conclusion in this clinic that where Indian eyes are concerned, hemorrhage of a degree calculated to cause some embarrassment must be expected in a high percentage of cases in which a conjunctival flap is used. With a bridge flap, this is more marked. Ordinarily the application of adrenalin does not influence this state of affairs, although it does so in Indians with colored irides. We have formerly discussed the probable reasons for this. A similar problem is the poor response of the Indian eye to mydriatics, such as atropine, cocaine, adrenalin. This is mainly because the deeply pigmented iris is more rigid on account of the greater mass of inelastic pigment.

The production of a large central aperture in the anterior capsule is admitted by most capsulotomy operators to be most desirable. I would go further and say it is a *sine qua non* if one wishes to get uniformly good results, but there is no simple effective method described of attaining this end with certainty. We have tried practically every known method and failed to devise a simple technic for procuring a large central aperture in the anterior capsule. For some time (over three years), we have been experimenting with new apparatus and finally have tried an old procedure dished up in a new way; namely, the construction of a large tongue-shaped flap in the capsule, executed with the knife at the time of making the section. This is subsequently torn off at its hinge, either before or after the delivery of the nucleus, with a suitable forceps. We are not absolutely satisfied with this, although it gives excellent results, just because it is not sufficiently simple.

The method of preliminary capsulotomy practiced here for about a century has a great many points in its favor, especially, as we have recorded before in these reports, when dealing with complicated cases. The great objection put forward by critics, that it tends to empty the chamber and make the section difficult, seems to us weak, for numerous operators here have found no difficulty in this respect.

The difficulties which are presented by a small rigid pupil must be kept in mind by operators in this part of the world. How resistant the pigmented pupil can be to a mydriatic is illustrated by a series of one hundred consecutive cataract cases. In fifteen the pupil was 2 mm., or less, in diameter before dilatation, and in only two of these did it dilate to more than 5 mm. under atropine and cocaine. In seventy-four it was 2 to 4 mm. in diameter, dilated to 5 mm. or less in thirty-five eyes, between 5 and 8 mm. in thirty-six eyes, and only reached 8 mm. in three. In eleven the pupil was 4 mm., and dilated to between 5 and 8 mm. in ten of them. Thus in nearly 50 percent the pupil remained 5 mm. or under.

Such stiff small pupils are often a nuisance at the time of operation, and must be dealt with *secundem artem* so that the delivery of the lens may not be prejudiced. When employing the Barraquer type of intracapsular operation in such cases, we often divide the sphincter below. This leads to a few remarks with regard to the different types of operations employed here. Looking back on an experience of some 20,000 cataract extractions done with due regard to the patients' interests and work in addition to arranging group series for statistical study, one realizes that rightly or wrongly, certain conclusions have forced themselves upon us.

Admitting, as we did at Oxford in

1927, that the immediate postoperative results by the intracapsular method were better than those attained by capsulotomy, provided it was carried out without undue displacement of vitreous or involvement of the iris in the section, the general question arises as to the best and safest method of removing the lens in its capsule, and the type of cases to which this method should be applied. There was choice between expression (Smith) and phacoerisis (Barraquer) and removal with force, after the so-called Stanculeanu or Knapp method. We consider that the latter ought to be referred to as Terson's method (1871) although we often refer to it as Knapp's method, since he rejuvenated it in India. The Smith technic is excellent in some cases in experienced hands, but when adopted by the average operator, it is liable to give rise to undue trauma. In the hands of the inexpert, it is quite likely to give a very high percentage of poor results, such as drawn up pupils, vitreous escapes, vitreous adhesions to the flap, and so on. In the hands of an expert, we consider it is eminently suitable for morgagnian cataracts and types of cataract with very weak zonules, in eyes of the nonbulging, low tension type. It has its place in any big clinic.

The Barraquer procedure is associated with less trauma than Smith's expression, but it involves a complicated instrument, liable to foul and requiring expert habitual operating to get good results. It is quite liable to set up embarrassing situations, although with reasonable care in a well-organized theatre, there is no reason why it should do so. We have tried Professor Barraquer's latest form of pump which he kindly sent over. It is a beautiful apparatus and we have been more and more won over to its use. An operation by this method often results in "the perfect" extraction. When the lens is removed by "tumbling" it out of its seat on the face of the vitreous, and the iris falls back into the patellar fossa, with the pupil round and fairly well contracted in this position, it is a pleasing sight to any cataract operator. We prefer any instrument for delicate application to the eye to be long, like a pencil.

The resistance of the zonule, the condition of the vitreous the intraocular tension (actual or potential) are the key points in all three procedures. It is most disappointing that the very condition for which we most required the Barraquer procedure, namely the immature cataract, is that in which it cannot be recommended to any but the most expert, and even then a grave risk to the patient is involved.

For simplicity of instrumentation and a minimum of trauma, the Knapp procedure is perhaps the best of the three; but like the other two it has only a limited application. It is excellent for hypermature cataracts, except morgagnian for which it is unsuited. It is not suited at all to immature cataracts with tough zonules; and this is a most important, weak point, for one is left with a very messy eye in an oldish person, if one comes away with half the anterior capsule and some sticky cortex, the bulk of the latter remaining behind. It is also unsuited to friable capsules which give way more rapidly than the zonule. Although it is said that in such cases one is left with a perfectly good capsulotomy and can proceed to evacuate the nucleus and cortex, in practice such a forceps capsulotomy may result in an irregular tear running into the equatorial region, and an accidental zonule tear as well. If a capsulotomy is performed with a forceps, it must be deliberate, not an accident, and made with a suitable instrument.

Old arguments for and against extraction in the capsule are still produced, but Pagenstecher's chief criterion is still best. Each case is determined on its own merits, but it is largely the condition of the zonule which decides. When one finds distorted pupils, boat-shaped pupils, vitreous threads adherent to the angles of the wound throughout the section, or invading the angle, it is well for the operator if he is able to say that the vision is good, for he has done a very poor job from a mechanical point of view.

With regard to extraction with capsulotomy, as done in various fashions,

we would employ it in all those cases where the intracapsular procedures are unsuitable, over 50 percent of our cases. This figure, however, is only approximate, an opinion of the moment, and is subject to variation according to the types of cases admitted.

Government Ophthalmic Hospital.

EXTREME BILATERAL EXOPHTHALMOS

Report of Two Cases with Autopsy Findings in One

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AND
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Both cases progressed in spite of treatment of all kinds, to corneal ulceration and loss of vision. Autopsy in one case showed increased fibro-fatty connective tissue elements in the orbits with marked atrophy of the muscles. Read before the Pacific Coast Oto-Ophthalmological Society, June, 1932.

The necessity of enucleating both eyes because of extreme proptosis and consequent corneal destruction was first recorded by Lorenz in 1857. In the same year, von Graefe reported five cases of extreme chemosis of lids and conjunctivae and protrusion of the eyeballs in association with hyperthyroidism with three of the five ending fatally; although in his cases enucleation was not resorted to. Since then, the literature has been strewn with such reports, usually mentioning the condition in association with Basedow's disease. And yet, when we were confronted with the two cases herein reported, we could get little practical help from fellow ophthalmologists throughout the country to whom we wrote for suggestions. Not only we, but several consultants, tried continually for more than two years in each case to arrest the vicious and destructive process. Any help which we rendered, if not wholly fanciful, was at best transitory and of no avail. A glance at the photographs of our second case here reproduced will explain why our procedures included scarification of the edematous conjunctivae, multiple punctures, canthoplasty, conjunctivoplasty, resection of redundant welts of conjunctiva, suturing together the lids—which sutures invariably tore out within a few days—and finally, in the first case, double enucleation. We did not attempt section of the cervical sympathetics as detailed by Mayo, because the proptosis was evidently too extreme to be accounted for by stimulated action of the sympathetic nerves upon Mueller's smooth muscle fibers within the orbits.

W. R. Parker reported an interesting case of luxation of the eyeballs in which both eyes were lost. In the discussion, Carl Fisher, referring to the action of Mueller's muscle in the production of exophthalmos, said, "An exhaustive monograph by one of Landström's pupils has shown clearly that the Mueller-Landström unstriped muscle complex cannot produce more than a slight exophthalmos. From its insertion this is mechanically impossible, even if the unstriped muscles were strong enough to counterbalance the force of the recti."

Besides these local measures—as will be brought out in the reports—surgery was directed at the toxic thyroid glands. In a fairly extensive search of the literature, we find that thyroid surgery, while correcting the associated hyperthyroidism, has no beneficial effect in arresting the progress of the orbital edema and consequent eye destruction.

Deep x-ray therapy both to the thyroid and to the orbital regions seemed for a time to promise some relief, but in the end was rated as "disappointing".

A résumé of the salient points in connection with our two cases may be put down as follows:

Case 1. A male, farmer, aged fifty-six

years, was referred to us May 24, 1920, with the following symptoms: general weakness, sweating, progressive loss of weight in spite of good appetite, marked tremor of the fingers on extension, pulse 120, feeling of warmth; all classical symptoms of hyperthyroidism. The thyroid was somewhat enlarged, particularly the right lobe. Wassermann test, urine, blood counts, and neurologic examinations all were negative. Both eyes were protruding markedly, so that the puffy edematous lids could not be closed over them. Rolls of firm edematous bulbar conjunctiva protruded out of the palpebral fissure on the right and the same condition existed, although it was less marked, on the left. On the left cornea, midway between the pupil and the lower limbus, were two grayish spots of infiltration. The fundus on this left side could be seen clearly, and manifested little, if any, deviation from the normal appearance, especially at the first examination. This was surprising in view of the general aspect of the orbital contents and meant that the pronounced edema and intraorbital pressure had come on so gradually that the optic nerve and vessels had adapted themselves to their presence. At later examinations, a slight haziness of the disc margins was noted, but there was no discernible elevation unless it occurred after corneal desiccation, infiltration, and ulceration from exposure had obstructed our view of the posterior pole of the eye. Retinal vessels were normal as to caliber and course. The exophthalmos was non-pulsating with no discoverable bruit, nor other evidence of arteriovenous aneurysm. Eye movements were greatly limited in all directions. The right cornea was already extensively ulcerated and sloughing. In spite of the less radical surgical procedures enumerated earlier in this discussion, it became necessary within six weeks to enucleate the right eye because of the total corneal destruction and marked discomfort.

Three points in connection with the enucleation are worthy of note: First, it was practically bloodless, which fact does not substantiate the belief of some that venous stasis produces the protrusions. Second, the muscles cut with a gritty feel, indicating that a fibrosis was, at this stage, well advanced. Third, the stump, following enucleation, progressively protruded for several months and remained until death, two years later, so prominent that the eyelids could not successfully be closed over it.

Shortly after the patient was referred to us, we had the superior thyroid arteries of both sides ligated; which procedure was followed by a rapid gain in weight and the subsidence of the general thyrotoxic symptoms, but which had, as mentioned before, no beneficial effect upon the exophthalmos or associated eye symptoms.

When the patient was first seen, we had investigated, as well as might be done under the circumstances, for any signs indicating pituitary involvement. No bitemporal hemianopia existed. Repeated stereoscopic x-rays of the head outlined a normal sella, in spite of which some consultants favored the opinion that a cyst or neoplasm of the hypophysis existed; so an intranasal decompression was made, removing the roof of both sphenoids by the trans-septal route. Radium was used in this area. Although a tentative diagnosis of possible intracranial neoplasm had been made, there was no strong support for the diagnosis either by x-ray, neurologic, or the general examinations.

That which had occurred in the right eye was later repeated in the left, and it, too, was enucleated after corneal destruction.

Two-and-a-half years after we first saw the patient, he died with the classical symptoms of acute meningitis following a head cold, the presumption being that infection entered at the site of the decompression operation. No necropsy was done.

Case 2. A sixty-year-old blacksmith came to us stating that five weeks before, he had gotten hay dust in his left eye causing an irritation which had lasted a few days, then subsided only to appear again two days before he entered our clinic. There was perceptible swelling of the left upper eyelid. The episcleral tissue had an edematous, watery appearance, but this promptly subsided

on using adrenalin locally, as did also the slight injection of the conjunctival vessels. Repeated examinations for foreign body revealed nothing. In two weeks the right lower lid was perceptibly puffy, and there was intermittent discomfort about the eyes and mild lacrimation. Schiötz tonometer revealed the pressure as O.D. 24; O.S. 30. The vision then was O.D. 20/25—1; O.S. 20/32—2. The nose, throat, ears, and paranasal sinuses were negative.

General examination showed negative Wassermann, normal blood, normal urine and a normal stereoscopic picture of the skull. The patient had an adenoma of the thyroid on the right side. This extended down behind the sternoclavicular joint, but there were then no general symptoms of thyroid toxicity. The eye symptoms, however, were well begun.

Another painstaking general examination was made by the same internist six weeks later, which revealed moist skin, tachycardia, tremor, loss of weight in the presence of good appetite, and a basal metabolism of plus thirty-one. Neurologic examinations, x-rays of the head, and Wassermann were again all negative.

Three months after the patient first presented himself, the photograph which we print (fig. 1, A), was taken. Immediately thereafter a thyroidectomy was performed. Following the operation all thyrotoxic symptoms disappeared, the patient gained weight, and reported that, but for his eyes, he felt extremely well. His metabolic rate fell to below normal.

The second photograph (fig. 1, B), was taken three months after the first, and the third (fig. 2), was taken in April, 1929, four months after the second. These convey the story more graphically than words, showing how edema, chemosis, exophthalmos, and corneal exposure gradually progressed in spite of pressure bandages, canthotomy and extirpation of generous rolls of extruded conjunctiva. In June, 1929, the vision was as stated: O.D. 20/20—1, O.S. 20/32—2; in November, O.D. 20/32, O.S. 16/200; in March 1929, O.D. counts fingers with effort, O.S. light projection; and in May, 1929, O.U. light perception. For the remaining eighteen months of the patient's life, the vision recorded only light perception in each eye.

Fig. 1, A

Fig. 1, B

Fig. 1, A (Merrill and Oaks). The second patient, September 15, 1928, four months after first complaint and just prior to thyroidectomy. B. The same patient, December, 1928, three months after thyroidectomy and seven months after beginning of symptoms.

Statistics show that the corneal process is more severe in men and also that death from the general affection supervenes more frequently in male patients.

Because of the history in this case, allergy skin tests were conducted with several varieties of hay dust, but the patient was sensitive to none of them. Quite naturally, even though erroneously, the patient ascribed his whole train of symptoms to getting hay in his left eye in May, 1928. On November 20,

1930, the patient, still appearing about as in his photograph of April, 1929 (fig. 2), suddenly became dyspneic and died of acute cardiac dilatation.

Dr. Orin A. Ogilvie, clinical pathologist at Salt Lake City, performed the autopsy, submitting his findings in a formal report, which is available to anyone desiring it. From it we mention the items which interested us most. The greatly swollen conjunctivae did not, after death, protrude; which argues against hyperplasia of tissue or excess deposit of intraorbital fat. Our investigation of reported similar cases makes clear that an increase of orbital fat—which is one theory to explain the ex-

Fig. 2 (Merrill and Oaks). The same patient, April, 1929, seven months after thyroidectomy and practically a year after complaint began. He continued to present about this same appearance until his death, November 20, 1930.

ophthalmos—does not seem to be borne out by findings in cases where the orbits have been explored. There was pronounced dilatation of the right side of the heart. The "epicardium" showed "a fine film of fibrosis as well as a great increase of fat, the latter extending over onto the left ventricle particularly". Fatty infiltration of the myocardium was marked, and it was streaked by fibrosis. The spleen was small (arguing against xanthomatosis). The pancreas was "enlarged fifty percent by fatty infiltration; parenchyma atrophic, vessels sclerosed and congested". Kidneys showed no unusual pathology. Unfortunately, the suprarenals were not examined; or at least, the findings were not recorded. As to the orbits, Dr. Ogilvie makes the following record: "Orbital muscles, fat, nerves and vessels bound more firmly together than is normal by fibro-fatty connective tissue elements. . . . Microscopic examination of cross section posteriorly on left side shows marked atrophy of muscles and optic nerve with fibrous and fatty areolar connective tissue replacement; small vessels are sclerosed; large vessels and motor nerves are less affected; round cell infiltration (perivascular) is noted here and there. Scalp and calvarium negative. Meninges, vascular sclerosis, congestion and edema marked; no tumor or meningitis. Brain, vessels very sclerotic (large and small) and congested; no neoplasms, abscesses, hemorrhages; no areas of softening".

Perhaps it is preferable to take note of facts without trying to interpret them, and yet we are sure a few suggestions from the literature will be of interest to our readers.

Herman Stewens believes he has discovered a direct relationship in these cases between the thyroid disturbance and hypophysial action. His report that hypophysin, one-half to one cubic centimeter daily, with pituitrin later and also hypophysin in tablet form, markedly helped the chemosis in an aggravated case such as is under discussion, is worthy of our most careful attention.

Baker of Johns Hopkins, in 1909, found sixteen cases of bilateral exophthalmos in conjunction with chronic nephritis. The relationship is not yet explained, though some think it due to the involvement of the adrenals. Large adrenals and nephritis are often associated with exophthalmos. Also the feeding of thyroid to guinea pigs produces enlargement of the adrenals. Hird, of the University of Birmingham, and others think the exophthalmos may be due to a circulating toxin acting upon the sympathetic system. Extreme cases as herein described could not, for reasons we have stated, be placed in this category.

Christian's syndrome, consisting of exophthalmos in conjunction with polyuria, defects in the cranial bones and dwarfism in children, is considered to be due to disturbance of pituitary func-

tion. It is associated with thyroid hyperplasia, with pituitary and suprarenal hypoplasia, and often with disturbance of lipoid metabolism. Possibly an asynergistic action of the suprarenals, thyroid and pituitary secretions may be found causative in the class of cases we are reporting. The infantile types are presumed to be due to hereditary defects, but such a conclusion is not tenable. There are probably many unknown elements in the problem.

While determination of the etiologic factors is of prime importance, our immediate need is a procedure which will effectually preserve the patient's vision. This in moderately severe cases may sometimes be accomplished by orbital fat removal, but to date extensive orbital decompression seems to offer the greatest hope of improvement in pronounced and "malignant" cases.

Dr. Howard C. Naffziger, in the Annals of Surgery, October, 1931, outlines his operation for complete decompression of the orbit and optic foramen. He removes both lateral walls and the roof of the bony orbit and also opens the bony and fibroperiosteal rings at the optic foramen, reporting restoration of vision following such a procedure.

Sachs performed a decompression not quite so extensive, and later reoperated on the same case because the benefit derived at first, proved to be only temporary. Further detailed reports of operated cases are most desirable so that the profession may properly evaluate the procedure and know the results to be expected, especially as to their permanency.

Kuhnt, in 1912, advocated orbital decompression by removing the temporal orbital wall, but this alone seems not to be sufficiently radical.

W. Falta, in 1913, noted a great increase in volume of the extraocular muscles as did also Naffziger, but this enlargement seems to be due to edema rather than to actual muscle hypertrophy. Microscopic examination of the immensely enlarged muscles has revealed a degeneration and atrophy, with progressive fibrosis consequent upon the pronounced and prolonged orbital edema.

Dr. H. V. Würdemann kindly sent an abstract and photograph (fig. 3), of a case of this kind which he published in Ophthalmology, in April, 1906.

A carpenter, sixty-one years old, was found to have general asthenia, temperature 101°; pulse 90; heart sounds intermittent; enlargement of the thyroid gland, which was sensitive to pressure; great proptosis and chemosis; cornea steamy; pupils apparently dilated; purulent discharge from both eyes which showed streptococci, pyogenic and other cocci; no paralysis; eyes could be moved in all directions; vision equal to movement of large objects; purulent discharge from both sides of nose.

Fig 3 (Würdemann). Exophthalmos in fatal thyro-toxicosis.

Diagnosis: Exophthalmos with secondary ulceration of the cornea; typical exophthalmic goiter.

This condition went on for about one week when the right globe burst. The eye was enucleated but nothing was found in the orbit. The patient died from meningitis, March 6, 1904.

Abstract of autopsy: Thyroid enlarged; adrenals undergoing degeneration; heart reduced in size; large thyroid gland; microscopically, left eye filled with bloody purulent material; brain cortex showed many degenerative changes; Nissel's granules entirely obscured; white and red thrombi in capillaries, arterioles and venules; chorioid plexus infiltrated; pituitary body much enlarged; endothelial degeneration of pituitary body, thyroid and adrenals.

Bibliography

Atkinson, D., Lisser, H., and Shepardson, H. C. Pronounced exophthalmos in case of adenomatous goitre without hyperplasia. Endocrinol., 1928, v. 12, pp. 680-84.

Böhm, F. Diagnosis and surgical treatment of exophthalmos. München. med. Wchnschr., 1929, v. 66, pp. 51-54.

Brana, J. Advanced stage of Basedow's exophthalmos and lagophthalmos. Gyógyászat, 1927, v. 57, p. 58.

Burch, F. E. Exophthalmos of Graves' disease. Minnesota Med., 1929, v. 12, pp. 668-75.

Falta, W. Die Erkrankungen der Blutdrüsen, 1913, p. 50.

Gasteiger, H. Rare ocular changes (exophthalmos, sacs under eyelids, etc.) developing after operation for goitre; case. Wien. klin. Wchnschr., 1931, v. 44, pp. 887-889.

Hartmann, E., and Delthil-Lacan, Mme. S. Case of exophthalmos associated with extensive destruction of bones of skull and face. Bull. Soc. d'Opht. de Paris, 1930, p. 185.

Heath, P. Xanthomatosis or lipoid histiocytosis; ocular observations in two cases of Christian's syndrome; correlation with other ocular syndromes. Arch. of Ophth., 1931, v. 5, pp. 29-54.

van der Hoeve, J. Exophthalmos, Nederl. Tijdschr. v. Geneesk., 1930, v. 74, pp. 713-19.

Jessop, W. H. Three cases of exophthalmic goitre with severe ocular lesions. Trans. Ophth. Soc. U. Kingdom, 1896, v. 16, pp. 187-199.

Lewis, J. B. Ocular signs of exophthalmic goitre. Med. Jour. Australia, 1927, pp. 44-47, Supp. 2.

Lyon, E., and Marum, G. Schüller's disease (Christian's syndrome). Fortschr. a. d. Geb. d. Röntgenstrahlen, 1929, v. 11, pp. 463-67.

MacCallan, A. F. Case of bilateral exophthalmos caused by lymphatic edema of orbital tissues. Lancet, 1922, v. 2, p. 1066.

Moore, R. F. Exophthalmos and limitation of eye movements of Graves' disease. Lancet, 1920, v. 2, p. 701.

Naffziger, H. C. Progressive exophthalmos following thyroidectomy; pathology and treatment. Ann. Surg., 1931, v. 94, pp. 582-86.

Parker, W. R. Double luxation of eyeballs in case of exophthalmic goitre. Trans. Amer. Ophth. Soc., 1921, v. 19, pp. 129-134.

Piqueras, E., and Torres, E. Discrete hyperthyroidism with very pronounced exophthalmos. Siglo. méd., 1929, v. 83, pp. 271-73.

von Pappen, A. Affections of the cornea and exophthalmos in Basedow's disease. Deutsche med. Wchnschr., 1910, v. 36, pp. 2002-2005.

Rowland, R. S. Xanthomatosis and reticulo-endothelial system; correlation of unidentified group of cases described as defects in membranous bones [exophthalmos and diabetes insipidus (Christian's syndrome)]. Arch. Int. Med., 1928, v. 13, pp. 611-74.

Ruedemann, A. D. Eye changes accompanying hyperthyroidism. Ohio State Med. Jour., 1930, v. 26, pp. 318-20.

Scalinci, N. Pathogenesis of exophthalmos in Basedow's disease. Morgagni, 1926, v. 68, pp. 1025-35.

Stewens, H. Progressive exophthalmos after goitre operation; relations between thyroid and pituitary body. Ztschr. f. Augenh., 1931, v. 80, pp. 137-45.

Wheeler, J. M. Exophthalmos associated with diabetes insipidus and large defects in skull bones. Arch. of Ophth., 1931, v. 5, pp. 161-74.

Würdemann, H. V. A typical exophthalmic goitre with endothelioma of the pituitary and thyroid bodies. Death from general sepsis. Autopsy. Ophthalmology, 1906, April.

Zimmerman, L. M. Exophthalmos following operation for relief of hyperthyroidism. Amer. Jour. Med. Sci., 1929, v. 178, pp. 92-99.

NOTES, CASES, INSTRUMENTS

FOREIGN BODY IN EYE WITH NEGATIVE X-RAY REPORT

RALPH I. LLOYD, M.D., F.A.C.S.
BROOKLYN

The removal of foreign bodies from the eye by magnet is a common procedure but there are often features associated with an individual case that make it worth reporting. The features of the case offered here are the failure of the x-ray to locate a piece of steel in the lens; the necessity of including a trial with the magnet as a part of the routine examination in every case suspected of having steel in the eye when the x-ray report is negative; the short time required for the development of siderosis under certain conditions; the absence of siderosis for months if the steel is in the lens; and the fact that many knife handles are made of nonmagnetic materials.

F. S., aged eighteen years, came to the office for an explanation of recent blurring of vision of the left eye. The right eye was normal in every respect and can be omitted from consideration.

The vision of the left eye was 5/200. It had been blurry for but one week. The poor vision was caused by a cataract of the traumatic type but there were no signs of siderosis with the pupil dilated or contracted. There were no fibrin deposits on the posterior corneal surface and no adhesions, inflammation, or irritation. An almost imperceptible scar could be seen with the slitlamp in the cornea anteriorly but a very plain scar where the fragment had passed from the cornea into the anterior chamber. There was a very evident scar on the anterior surface of the lens and what I assumed was the exit wound on the posterior surface. An x-ray was made then by a roentgenologist. The report was negative. I still felt there must be a foreign body in the globe but before repeating the x-ray examination, thought it worth while to try the magnet. Much to my surprise the piece of steel was easily drawn into the anterior chamber and left upon the anterior surface of the iris because the patient refused to allow removal of the foreign body from the eye until he had consulted his parents. Because of his timidity, the fragment remained in the anterior chamber three days, after which time it was removed from the eye without difficulty. After the fragment was deposited upon the iris, it could not be seen, even with a loupe, probably because it dropped into one of the crypts. The magnet would draw it from its hiding place but it would disappear when the current was turned off. The day following these attempts the eye was very irritable and watery, and a marked ciliary injection had appeared. Two days after removal of the foreign body from the anterior chamber (five days after the steel was drawn from the lens), all irritation had disappeared and after another two days there was very evident siderosis of the anterior lens capsule around and below the entrance wound and also on the iris below this area. The iris stain disappeared in three months but the lens stains, although quite faded, could still be seen two months later; ten months after the accident they had completely disappeared. After the keratome incision was made, but while the point of the instrument was still within the anterior chamber and not far from where the steel had been drawn by the magnet, the Lancaster hand magnet was placed in contact with the handle of the keratome in order to pull the steel along with the instrument as it was withdrawn, but the steel did not budge. When the same procedure was followed with the iris forceps as the intermediary, there was no difficulty in getting the steel out of the eye. For about two months, there were a number of floating dots in the aqueous and occasionally a piece of lens cortex would drop into the lower angle of the chamber. Twice there were mild attacks of glaucoma which yielded to nonoperative treatment and several

months after the injury the lens was very thick and clouded but less swollen than at any time since the fragment was pulled out of it. When the patient was told at the first examination that something was in the eye, he denied accident of any kind but his mother reminded him of what he thought was an inconsequential matter some nine months before. While working with a hammer and chisel, something had flown into the eye and his employer had sent him to the insurance carrier's physician who gave him eye drops which seemingly cleared up all difficulty in two days, after which he returned to work. What was considered the scar on the posterior lens surface was really the foreign body deep in the lens with a casing of light-colored material completely obscuring the black piece of steel. The siderosis did not develop until the steel was exposed to the aqueous but when the steel was removed from the eye, considerable rust and other forms of iron resulting from the contact of lens material with it for nine months had to remain behind. When the steel was pulled into the chamber, its incrustation came with it and was probably of a nature to dissolve quickly in the aqueous, with pernicious effect. We can say, however, that there was no siderosis before the steel entered the anterior chamber and that seven days after the steel came into contact with the aqueous, there was a well-developed siderosis. This question of the length of time necessary to produce siderosis is of great medicolegal importance and is the main reason for this report. That iron may remain in the eye for as long as fourteen years without siderosis is a personal observation. This fragment was imbedded in the ciliary body and there are cases in the literature of longer residence without damage to the eye. A fragment imbedded in a lens for about ten years caused no damage, but when the lens was removed, the eye became infected.

Pieces of steel remaining in the vitreous for several years have also been observed but the explanation of these exceptions to the general rule is the formation of a capsule that excludes contact with dissolving fluids or with tissue forming chemical combinations that diffuse readily. The aqueous seems to be the medium in which chemical irritants are formed most quickly and in which encapsulation is almost impossible.

Before the steel was removed from the eye but after it had been deposited upon the iris, a second series of x-ray exposures was made by another technician who was informed that the fragment had been located in the eye; his result was also negative. Dr. Richard Rendich of the Brooklyn Eye and Ear Hospital made several x-ray exposures of the fragment at various distances from the film and unless the distance from fragment to film was correct, no positive shadow could be found. It leads us to think that small fragments well forward in the eye are least apt to show in x-ray exposures and the importance of the magnet in settling the question whether a magnetic foreign body is in the eye or not, follows without discussion. This procedure should be a part of the eye examination of every ophthalmic injury in which there is any suspicion of a foreign body even if reported negative in the roentgenogram. Cataract knives and keratomes are made with plain steel handles and also with plated handles. The latter are frequently of nonmagnetic material, making it impossible to get effective magnetic influence at the knife point although the blade itself may be of steel. The patient's statement that he had had no accident is quite in keeping with the history of the average case of small foreign body in the eye. The irritation occasioned by the "spark" is not great and unless the lens in the pupillary area is suddenly clouded by the exposure of the lens material to the action of the aqueous, the incident passes without occasioning comment. Foreign bodies of small size can enter the lens and if not remaining there produce very little opacity except at the point of entrance and exit.

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SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section of ophthalomolgy

March 11th, 1932

Dr. Douglas Wood presiding

The analysis of cases of secondary glaucoma

Dr. Peter C. Kronfeld (Chicago) by invitation, read a paper on this subject. He said that the daily variation of the intraocular tension in simple primary glaucoma was a well-established fact. With the peak between 5 and 7 o'clock in the morning and its lowest point in the late afternoon, the "normal" daily tension curve was found in normal eyes and in eyes affected with simple glaucoma. To explain these variations, several factors had been considered, namely; (1) changes in the distribution of blood, (2) changes in the osmotic concentration of the blood as brought about by ingestion and absorption of food, (3) the pump action of accommodation, and (4) the massage action of the extrinsic muscles.

It was generally agreed that changes in the distribution of the blood played the most important rôle among the factors mentioned. This view was based upon the experimental findings of Shepard (relative hyperemia of the skull contents during sleep) and upon the frequently confirmed observations that an eye affected with glaucoma simplex responded to experimentally produced changes in the distribution of blood with more marked changes in tension than the normal eye.

If, therefore, in certain rather rare types of glaucoma, the daily tension curve showed the lowest point early in the morning and its peak during the course of the afternoon (the inverse type), it was not likely that any of the factors mentioned above were involved since their action during the day could only lower the intraocular tension.

Hagen found the "normal" tension curve in 80.6 percent of his cases of simple primary glaucoma, and the inverse tension curve in 64 percent of his cases of secondary glaucoma. The inverse tension curve seemed, therefore, characteristic of secondary glaucoma. There were, however, many cases of secondary glaucoma in which the tension was high most of the time or behaved very irregularly.

Dr. Kronfeld had observed three cases of secondary glaucoma with inverse tension curves. The first case was that of a young man who developed a secondary glaucoma one or two years after a needling of a congenital cataract. A cyclodialysis was performed without improvement of the condition. The eye had to be removed one year after the cyclodialysis. The anatomical examination revealed a peripheral anterior synechia only in the area of the cyclodialysis. The remainder of the chamber angle was filled out by newformed tissue so that there was no communication between the lumen of the chamber and the lumen of the canal of Schlemm. The glaucoma in this case was most probably caused by primary obstruction of the filtration angle which was the result of the iridocyclitis accompanying the absorption of the lens.

The second patient was a young man whose one eye was struck by a tennis ball resulting (four months after the injury) in a very mild iridocyclitis, slight dislocation of the lens, and retinal detachment with a retinodialysis below. This patient showed a very regular inverse curve which was not influenced by miotics or mydriatics, by rest in bed, or by light-obstructing bandages over both eyes. The rise of tension in the morning could, however, be prevented if the patient slept in the daytime, but set in immediately after the patient awoke.

The third patient was a young man with bilateral chronic uveitis of long standing and probably retinal detachment. The fundus was never seen clearly enough to confirm the diagnosis which was based upon the lack of light perception in the upper half of the field.

In each of these patients puncture of the anterior chamber was performed with the result that for from two to five days the daily rise of tension did not occur or was very slight.

Similar cases were reported by Koellner, Thiel, Raeder, and Fiegenbaum. Raeder (University Eye Clinic in Oslo) also found that the daily variations of intraocular pressure could not be influenced or modified by any means except by letting the patient sleep in the day time. This procedure delayed the rise in tension until the patient awoke.

Dr. Kronfeld said he did not believe that glaucoma could be fully explained by any simple mechanism. He, however, suggested the use of simple mechanisms as a working hypothesis. In his three cases it was at least highly probable that the vitreous did not play an active or intermediary rôle in the production of glaucoma (because of the absence of a peripheral anterior synechia in the unoperated portions of the first patient's eye and because of the severe destruction of the vitreous in the two other cases). Changes in the amount of blood in the choroid were not likely to cause increased tension in the daytime because they were almost certainly the cause of the high tensions in the early morning hours (the "normal" curve). By exclusion we were led to seek the cause of the increased tension in our cases in the anterior segment. The first case was most likely a clear-cut case of "retention" glaucoma because it was an example of an eye with complete obliteration of the filtration angle and formation of a membrane on the iris. The fact that this eye had normal tension at night indicated that there was no call for a safety valve because there was no increase in the amount of fluid present in the eye during the night. The prompt rise in tension during the forenoon would consequently be the result of some fluid entering the eye; in other words, of a production of fluid which did not take place during the night.

In the second case the channels of exit were most probably anatomically intact. The protein content of the aqueous, however, was increased and this, for physico-chemical reasons, impeded the outflow into the canal of Schlemm to some extent. Increased protein content of the aqueous with normal intraocular pressure was so frequent that it could only be considered as a secondary factor. To explain the definite daily inverse variations in tension in this patient, we would have to assume an abnormal amount of production of fluid, a condition that might be called "hypersecretion." The dislocated lens and the inflammatory process might by means of a short reflex stimulate the ciliary body to a greater extent than the activity a normal eye did in the daytime. The fact that sleep or complete rest of the eye immediately lowered the tension favored the assumption that the action of the ciliary body was the response to the minor stimuli connected with the use of the eye.

The fact that each of these three cases responded well to a puncture of the anterior chamber (more or less lasting hypotony) suggested also that the increased tension in these cases had something to do with the formation of intraocular fluid. He therefore suggested the assumption of a discrepancy between fluid production and fluid absorption as the probable mechanical principle of secondary glaucoma in cases with inverse daily tension curve. This was an old theory, and the only point about it that might be new was that from Dr. Kronfeld's observations it was possible that there was no (or very little) fluid production at night and also that the production was not automatic, but, at least to some extent, of reflex character.

Discussion. Dr. Walter Fink (Minneapolis) asked Dr. Kronfeld why the paracentesis tended to keep the pressure low for so long a period, if the tension was due to hypersecretion.

Dr. H. J. Rothschild (St. Paul) asked, if the production of fluid was

lowest during the sleeping hours, how Dr. Kronfeld explained the increased intraocular tension during that time, in primary glaucoma.

Dr. Carl Larsen (St. Paul) asked Dr. Kronfeld if he could explain the favorable action of glaucosan, which was sometimes observed in these cases.

Dr. Kronfeld said that in a patient with primary simple glaucoma the paracentesis had no lasting effect at all so he would conclude that the increased tensions that occurred in that type of glaucoma had nothing to do with the function of the ciliary body.

In the type of case presented tonight, if one took out a certain amount of fluid and let the ciliary body reform it, the tension of the eye, except for the first few hours, would remain low for from two to five days. The removal and regeneration of the aqueous seemed to bear a very intimate relation to the principle of increased tension in these cases; therefore, he would think that the increased tension was due to an increased amount of fluid present in the eye.

The high tension in primary simple glaucoma most likely had nothing to do with the production of fluid. It was probably due to an abnormal amount of blood being present in the uvea.

Adrenalin or any of its derivatives given in secondary glaucoma, helped in only a certain number of cases. It usually prevented the high night tensions in cases of interstitial keratitis, but was of no avail in cases with inverse tension curve.

Pocket flap sclerecto-irido-dialysis for glaucoma

Dr. C. N. Spratt (Minneapolis) read a paper on this subject.

Discussion. Dr. Kronfeld said he could see one definite advantage in doing an iridodialysis instead of an iridectomy, and that was, because the farther back towards the ciliary body an incision lay, the more difficult it became to do a total iridectomy. Most of the time a considerable peripheral stump was left on the ciliary body, which easily became incarcerated in the wound. An iridodialysis, as suggested by Dr. Spratt, would leave no stump.

Dr. Spratt stated he used the curved scissors as in the original Lagrange technic. A straight pair might be used equally well, although with the latter there might be more danger of buttonholing the conjunctival flap.

In regard to Dr. Morton's question, Dr. Spratt said the reason for making a small incision was that in cases of high tension there was less danger of hemorrhage or sudden pushing forward of the lens. The iridodialysis could be made through a small flap with less damage to the eye, and there was quicker healing with the small incision. In cases where there was much inflammation, orbital injection of novocain, as was suggested by Halstead in 1884, was employed.

Retinal detachment

Dr. F. E. Burch (St. Paul) reported a case of this condition and showed the operative results.

Discussion. Dr. Kronfeld stated that Dr. Burch had given a very accurate picture of the present status of retinal detachment, especially the figures published from the Moorfield's Hospital were of great significance bearing out the fact that so-called disinsertion of the retina played a very important rôle. About four months ago Dr. Kronfeld had read a paper before the Michigan State Medical Society on disinsertion of the retina in which he gave his findings and results in his cases of retinal disinsertion, which at that time numbered eight, now fourteen cases. Dr. Kronfeld said when he attacked his first case he did not know that Gonin had reported some very bad results in cases of that type. Gonin had to do three or four ignipunctures for each disinsertion, which frequently fixed the retina in a faulty position. Dr. Kronfeld did several ignipunctures aiming at the central edge of the retina in his first case. He obtained complete reattachment in about 50 percent of his cases with the shortest period of observation since the operation being eight months. The recent report from Moorfield's hospital confirmed his opinion that the prognosis of these disinsertions was

not so bad. They were not easy to find and many times they were overlooked.

He had found that in disinsertions, the geometric axis of the tear usually lay very close to the geometric axis of the detached portion of the retina. If one bisected the angle of detachment, this line was very likely to point out the location of the tear. This held true for practically all tears in the lower half, and most of the disinsertions occurred in the lower half. If the patient had only a partial retinal detachment, this rule might prove helpful in locating the tear.

He believed that if one attempted to bind the retina down over a very large area in one sitting he would be likely to get adhesions in faulty positions and it would be better to produce only one small adhesion leaving it to nature to take care of the rest.

In spite of the good results obtained with the ignipuncture, he believed that the new method of Lindner and Guist was the ideal method for disinsertion, but he still agreed with Dr. Burch that for a small tear in the posterior segment an ignipuncture should be done.

Some results in radium therapy in ophthalmology and otolaryngology

Dr. Laura Lane (Minneapolis) read a paper on this subject and presented cases.

Walter E. Camp,
Recorder.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section of ophthalmology

April 8, 1932

Dr. Douglas Wood presiding

Reduction of accommodation from focal infection

Dr. A. D. Prangen (Rochester) read a paper on this subject.

Discussion. Dr. C. N. Spratt (Minneapolis) said that it was well known that certain athletes, certain horses, and others could perform and make better records on some days than on others. If a person became fatigued from exercise or disease he could not make the usual effort of accommodation. Donders, in 1860, brought out the fact that accommodation at the age of forty-five years varied with different individuals.

Dr. Prangen in answer to several questions said there were two distinct types of cases, one, the ophthalmoparesis, in which the cases just reported belonged and, the second type, with a lower grade or lesser degree of accommodative weakness. One was apt to regard the accommodative power of the second class as being good enough, while upon close analysis the accommodative power would be found to be below normal. Those cases with more marked ciliary weakness suggested, as just reported, a rather definite entity and responded to treatment. The lesser grades quite often seemed to be without etiology and required the addition of plus lenses to their static error for use in near vision.

In answer to Dr. Spratt's question, Dr. Prangen said the hemoglobin in the individuals reported was normal. It was true that any debilitating condition might affect the accommodation of the individual. Only those cases were brought up this evening for discussion which were apparently due to dental infection. In a recent paper published in the Arch. of Ophth. 1931, v. 6, Dec., p. 906, the entire subject had been gone into and all of their cases were reported with their apparent etiology.

All these individuals were definitely below the age of presbyopia. Metabolic studies of the action of the thyroid gland were negative in all five cases. Tuberculosis was not noted in any of the patients. In regard to the association with late syphilis, Dr. Prangen said that syphilis was not present in any of these five cases. Convergence insufficiency was the predominant imbalance of these individuals.

Practical and theoretical consideration of fusion

Dr. H. W. Grant (St. Paul) read a paper on this subject.

Discussion. Dr. H. McI. Morton (Minneapolis) said that so far as the strictly visual was concerned, it would

be in many ways, more fortunate for the cyclops than for the binocular animal. The complicated inter-relations of the two eyes gave rise to many perplexing problems. Binocularity had been developed just as had bilaterality, in almost all cases. Man was bimanular, he had two legs, two kidneys, and two eyes had developed. But binocularity had a different significance than other phases of bilaterality. Much of the theory of ocular dominance was untenable but it was true there might be ocular dominance. The eyes in the first place, from their mechanism, were essentially made to work in entire unison. The musculature of the eye was so exceedingly complicated in order that this binocular function might be in unison. There must be exact retinal identity in the two sides, and experimentation showed that there were different retinal areas which had marked photostatic function. So much was this so, that in all probability the eye was as much an organ of equilibrium as was the ear. All through the functionings of this complicated mechanism must be a constant relationship of one eye to the other; therefore, binocular vision had evolved for a fuller visual understanding. Back of all, was a horde of activities concerned with experience. We learned to see; we had remembrance, and we learned through remembrance. The eye was merely a visual intermediary, and we had without question a visual function that was related directly or remotely to every part of the cerebrum and of the cerebellum. Thus each area of the brain functioned, in whole or in part, for visual perfection.

He said that certain cases that were definitely in the class of weak fusion and low desire for binocular single vision would improve and develop binocular single vision and better fusion. He believed that some cases were functional and might be aided, but he also believed some presented congenital conditions having to do with rod and cone abnormality in the eye itself, congenitally defective eyes. Some were defective in the distal nerve mechanism of the eye, and many of them due to other congenital defects in the retina itself. The ocular mechanism had taken on decussation in the higher vertebrates. In the lower vertebrates, below the cat one did not find decussation; and above the cat, or in man, there was partial decussation.

Dr. John M. Robinson (Duluth) agreed that the predisposing cause of concomitant strabismus was a failure of the fusion centers, but that the exciting cause was very often peripheral, most commonly a refractive error. He had been following with interest the theories of S. T. Orton on the relation of so-called cerebral dominance to the specific reading disability, and the similar hypothesis of Travis in his work on speech pathology, and he felt that the ideas of these investigators might be utilized in the study of the origin of squint. Right-handedness and left-handedness were referable to the dominance of one cerebral hemisphere. The same applied to the eye. To determine the dominant eye he had used the common sighting test (Rosenbach's) and the "manuscope" devised by B. S. Parsons; but he preferred the simple test taught him by Dr. Bryng Bryngelson of the University of Minnesota, in which the subject held squarely before the face a piece of paper with a hole in it, gazing straight through this at the nose of the examiner. The dominant eye was seen behind the hole. About 65 percent of individuals were right-eyed, about 30 percent left-eyed, and three percent sight with one eye and then with the other. Usually the left-handed were left-eyed.

Dr. Robinson said he had been impressed for a number of years that the left eye was more commonly the squinting eye. In a recent series of 100 cases, 38 were anisometropic; and in the group there were 20 right-eyed squint cases and 18 with the left eye affected. The refractive error was here at work. But in the 62 who were relatively isometropic there were 39 left eyes affected as against only 23 rights. It was Dr. Robinson's impression that, in the absence of definite anisometropia as a causative factor, strabismus occurred on the non-dominant side. The figures given sustained that impression: the

proportion of 39 lefts to 23 rights approximating the relation of the number of non-dominant lefts to dominant rights in straight-eyed individuals. Moreover, in a group of between 50 and 60 children who had all been relieved of their strabismus either by refractive correction with or without fusion training, or by surgical measures, the formerly squinting eye was always the non-dominant eye. In one instance of alternating strabismus with (as usual) equal refractive error and normal vision, and with (as in half of his cases) a history of rickets, dominance could not be determined, but the mother, whom the child closely resembled, proved to be one of the three percent class with neither eye dominant.

All this might be immaterial and irrelevant to the immediate question of fusion but, insofar as the observations went, Dr. Robinson thought they tended to corroborate Dr. Grant's thesis that the fundamental weakness in strabismus was central in location, fixed and congenital, and that attempts to restore or greatly improve the fusion faculty (or from another viewpoint to alter the cerebral dominance), useful as such efforts might be in correcting the strabismus of young children, were a waste of time and effort in adult life and usually resulted in disappointment and not infrequently aggravation of the discomforts complained of.

(Travis had adduced evidence that training the right hand when the child was dominantly or naturally left-handed had, in certain unstable children, induced stammering; Dr. Grant believed that in later life the forcing of the undeveloped fusion faculty resulted in nervous discomfort, psychic or other. The ideas were similar.)

Dr. Grant (in closing) said a point he intended to bring out in his paper, but possibly did not sufficiently emphasize, was that a person might have an antipathy toward binocular single vision and still maintain it. When such was the case, this binocular single vision was maintained through the higher cortical centers and not through the occipito-gyric center. This was the thing which produced discomfort.

He agreed entirely with Dr. Prangen that treatment of alternating squint was very satisfactory without operative procedure. Dr. Peter stressed the importance of surgery in alternating squint which was not actually alternating, that was, high refractive error but with equal vision. Dr. Grant thought also, that one was able with stereoscopic training to produce fusion in most cases of alternating squint, but this did not necessarily mean binocular vision. The reason for stereopsis without binocular vision was that the two images as seen in the stereoscope or amblyoscope were always separated. With the red glass test, one simply produced a fusion of the eyes when the muscles balanced them through their own power.

Walter E. Camp,
Recorder.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

March 15, 1932

Dr. David W. Wells presiding

Uveo-parotid disease

Dr. Paul Chandler presented a white woman twenty-five years of age, who had developed bilateral swelling at the angles of the jaw about a month previously. Both parotid glands were swollen, firm to touch, but not tender. There was no reaction around the mouth of the ducts. There was a slight blush on the nasal side of the left eyeball. Pupils were equal and active; media clear; fundi normal. In the left eye, slitlamp examination showed a few cells in the aqueous. Nothing of note was found on physical examination.

This was thought to be a case of uveoparotid fever; first described by Heerefordt in 1909. Three cases of bilateral swelling of the parotid gland, with marked uveitis, were reported by him. In all these cases, a fever of long duration was present. There had been some thirty cases reported in the literature, mostly by Germans and Scandinavians, and a few by Englishmen. No one seems to be sure of the etiology. In some of the cases, tuberculosis had been found. That

the condition was an atypical form of mumps was the belief of some men. The uveitis in these cases was almost always bilateral, very severe, and of long duration.

This case had been followed for two weeks; during which time, although the pupil had been dilated, the uveitis had steadily become worse. Now there was a fairly heavy descemetitis. There were two large nodules on the pupillary border of the iris, larger than Koeppe nodules. There were a few dust-like opacities in the vitreous.

Megalophthalmus with question of intraocular tumor

Dr. Benjamin Sachs presented a thirty-one-year-old man, who had had large eyes, with melanosis of the sclera, since birth. The poor vision in the right eye had become worse in the beginning of 1931. There was no familial history of such an eye condition.

In January, 1931, the corneal diameter of the right eye was 15 mm., and that of the left 12.5 mm. Exophthalmometer reading was 23 mm. on the right and 19.5 mm. on the left. The right sclera was pigmented all around the cornea. Both anterior chambers were deep, especially the right. There was some heterochromia in the right iris. The pupil was small, with many posterior synechiae. There was iridodonesis; the lens tremulous but clear. The vitreous contained a few opacities; there was a moderate degree of myopia; the optic disc was slightly pale; the retinal vessels were rather tortuous; and vision consisted of shadows, temporally. The left eye, aside from the slightly enlarged corneal diameter and deep anterior chamber, was normal; and vision was 20/20. Tension was 10 mm. in the right eye, 18 mm. in the left (Schiøtz).

When seen again in October, 1931, in the right eye there was a large separation of the retina, involving the lower half of the fundus. Transillumination was faulty because of the melanosis of the sclera. The tension remained subnormal, and the eye, unchanged.

Dr. Sachs suggested that this could not be classified as a typical anterior megalophthalmus because that condition was usually bilateral, with an equal involvement of both eyes; was always found in males; and was said to be hereditary. This case was probably a congenital hydrophthalmus of the arrested juvenile glaucoma type.

Subarachnoid hemorrhage and bilateral vitreous hemorrhage

Dr. Virgil G. Casten presented the case of a forty-one-year-old housewife, who gave a history of hypertension of two years' duration. Vision had been good in each eye until four months ago, when suddenly she felt nauseated, and vomited. She became unconscious and very rigid, in which condition the patient remained for three or four days. Upon regaining consciousness, the patient was unable to see out of either eye. There was marked ecchymosis of the skin around the right eye. At present, vision right eye, was 4/200, and left, 1/200, eccentrically.

During the four weeks the patient spent in a general hospital immediately following the onset of her trouble, four or five lumbar punctures were done. The first two showed gross blood, and the others, xanthochromic fluid. Because of the absence of localizing signs and residual neurological defects, a diagnosis of sub-arachnoid hemorrhage was made. Recently her blood pressure was 170/120. Laboratory tests were: blood Wassermann and Hinton negative, no cells present; N.P.N. 24 mg.; P.S.P. showed sixty percent excretion in two hours; urine concentration test 1.010 to 1.011; x-ray of skull negative. Lumbar puncture showed normal pressure and dynamics. Total protein 45 mg. Peripheral fields, taken with a flashlight, were normal.

Upon looking directly into the eye, one was confronted by a dark grayish-black reflex of which no details could be made out; but, by looking into the extreme periphery, temporally, above, and nasally, normal looking fundus could be seen in each eye. Below, with a plus ten lens, numerous small and large grayish-white masses could be seen; and, with no lens, the fundus could be seen here and there between the whitish opacities which were thought to be

changed blood, such as beginning organization or deposits of fatty acids.

In his thesis last year, Dr. A. E. MacDonald reported four patients with subarachnoid hemorrhage, with subhyaloid hemorrhage also present. By serial section, he definitely demonstrated that there was no continuity between the intracranial hemorrhage and the intraocular hemorrhage as formerly reported at the Glasgow Ophthalmic Congress, by Patton, who stated that the subhyaloid hemorrhage was the result of direct leakage of blood through the subpial lymph spaces around the lamina cribosa, and perivascular lymph spaces around the central vessels.

It was thought that the mechanism here was a subhyaloid hemorrhage in each eye, with rupture of the hyaloid, allowing the escape of the blood into the vitreous. This did not happen in any of the four cases reported by MacDonald. In this case, the hemorrhage might have been arterial, instead of venous.

Subchoroidal hemorrhage simulating choroidal tumor

Dr. H. B. C. Riemer reported the case of a sixty-six-year-old woman whom he saw for the first time in October, 1927. She complained, at that time, of gradual failing vision, both eyes. Examination showed that this condition was due to incipient cataracts.

In September, 1931, she returned with a history that, about four weeks ago, the left eye suddenly became painful. She was nauseated, and vomited. Her family physician was called, and he treated her for four weeks.

Upon examination, Dr. Riemer found the left eye congested, cornea, steamy, pupil dilated and anterior chamber shallow: a typical picture of acute glaucoma. Tension was 48 mm. Vision was light perception and faulty light projection. The cataract appeared to be of the hypermature type, and Dr. Riemer thought that this probably accounted for the glaucoma.

In view of the faulty light projection, he hesitated in advising operation, but told the patient that it might be necessary to remove the eye if the pain did not subside. She was given a myotic to use every two hours, and was advised to return in one week.

When seen again, there was a slight improvement in the condition of the eye. The tension was 32 mm. Despite the fact that enucleation was advised, the patient insisted upon the cataract operation. Dr. Riemer removed the cataract in capsule. As he did this, a gray mass in the fundus on the nasal side was seen. This, he thought to be a tumor.

On the third day after the operation, the eye filled with blood. The patient remained in the hospital for six days. Light perception was not present upon discharge.

Three weeks after date of cataract extraction, she consented to enucleation. The eye was examined at the Massachusetts Eye and Ear Laboratory where it was discovered that what had appeared to be a choroidal tumor was actually a subchoroidal hemorrhage which had begun to be organized.

Etiology of strabismus

Dr. Ralph I. Lloyd read a paper on the above-mentioned subject which was discussed by Drs. Verhoeff, Lancaster, Wells, and others.

James J. Regan,
Recorder.

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IS SYMPATHETIC OPHTHALMIA TUBERCULOUS?

The numerical incidence of sympathetic ophthalmia is not so large as to constitute a community problem of major importance. But, to the individual patient and his family, and to the ophthalmic physician concerned in the case, this malady presents one of the most tragic experiences possible in life or in the realm of medicine. The determination of its etiology has long been counted among the seeming impossibilities of medical science.

Few were satisfied by the theory that the virus of the disease passed by way of the optic nerves and the optic chiasm from one eye to the other. Some, like the elder Fuchs, were disposed to believe that whatever organism was to blame traveled through the blood stream and so lodged in the second eye. Some twenty-five years ago Elschnig put forward his anaphylactic theory, according to which the disintegrated pigment of the injured uveal tract acts as an antigen. Knapp and Woods, among others, supported this theory and used uveal pigment therapeutically, with the object of diminishing the risk of sympathetic ophthalmia after injury.

The microscopic appearance of the granulomatous tissue in the primary and the secondary eye bears so close a resemblance to the tuberculous granuloma that a number of authors have tried to establish a relationship between sympathetic ophthalmia and tuberculosis. Several Japanese writers have written enthusiastically concerning the therapeutic value of "AO", a tuberculosis vaccine developed by Arima, Aoyama, and Ohnawa; and one writer, Nakamura, last year published a paper (Klinische Monatsblätter für Augenheilkunde, volume 89, page 43) upon the successful treatment of exudative uveitis and also sympathetic ophthalmia by means of "AO". All of these uveal conditions in which Nakamura has used the vaccine are regarded by him as having a very close etiologic connection with tuberculosis.

Meller, of Vienna, who has devoted a great deal of attention to tuberculosis in its relation to the eye, at last claims

to have proved definitely that sympathetic ophthalmia is tuberculosis locating in the uveal tract of the injured eye (Zeitschrift für Augenheilkunde, volume 79, page 95). The histologic and cultural bases of what may prove to be an epoch-making discovery are given in elaborate detail, with a beautiful series of illustrations.

The patient was a cabinet maker of forty-two years whose left eye was penetrated by a splinter of steel. The steel was removed, but six weeks after the injury with the usual symptoms of persistent iridocyclitis in the injured eye, the second eye became involved.

The pathologic changes in the injured eye were in every detail typical of sympathetic uveitis. Those who desire to continue the investigation along the lines laid down by Meller will be interested in the technique employed by Meller's Viennese colleague, the pathologist Löwenstein, in the study of Meller's case. The intraocular tissue was carefully ground in a sterile mortar for fifteen minutes or so until a black emulsion was formed; the emulsion shaken for five minutes with twice its volume of fifteen percent sulphuric acid; the mixture considerably diluted with sterile distilled water and vigorously centrifuged; the sediment washed with distilled water and again centrifuged; and the final sediment carefully flowed on to three tubes of egg culture medium with a pipette.

Distinct macroscopic growths of tubercle bacilli were obtained on these culture tubes, and microscopic cultures of the bacilli were obtained on cultures inoculated with the blood of the patient, taken on the day of the enucleation. Animal experiments were positive for tuberculosis in the cultures from both sources. Examination of the blood ten days after operation was equally positive.

Many medicinal remedies have been employed for sympathetic ophthalmia —Gifford's massive doses of sodium salicylate, antiluetics including ancient mercury and modern arsenicals, and tuberculin as recommended by some recent writers including Meller and Nakamura. Of interest in this connection is a very recent report by Wachendorff on the successful treatment of three cases of sympathetic ophthalmia with intravenous injections of atophanyl, a solution of 0.5 gram of atophan with 0.5 gram of salicylic acid (Klinische Monatsblätter für Augenheilkunde, volume 90, page 81). With his injections of "AO", the Japanese tuberculin above referred to, Meller combined the energetic use of mercury.

In another paper (Zeitschrift für Augenheilkunde, volume 79, page 110), Meller describes a previous case of severe sympathetic ophthalmia in which he was able to demonstrate tubercle bacilli in the blood stream; and he quotes with approval Hippel's declaration that "the histologic picture of sympathetic ophthalmia contains nothing that is in any respect in opposition to the diagnosis of tuberculosis".

Some may doubt the finality of Meller's triumphant conclusion that "a discussion which has lasted for decades on the question of the connection of sympathetic ophthalmia with tuberculosis is thus decided beyond cavil". It is often difficult or impossible to differentiate histologically between granulomatous conditions arising from separate causes; and the ultimte judgment may be that tuberculosis is simply one of several exciting agents of sympathetic ophthalmia. But the technique employed and the results obtained by Löwenstein and Meller should prove the starting point for much useful investigation. Meller suggests that the abundance of intraocular hemorrhage associated with perforating injury to the ciliary body may favor the lodgment of tubercle bacilli; but he at once proceeds to ask the question why sympathetic ophthalmia does not follow non-penetrating contusions of the eyeball, which also are often accompanied by profuse intraocular bleeding. The invasion of the second eye may depend upon an increased outpouring of tubercle bacilli into the blood stream and associated changes in the biologic qualities of the bacilli, adapting them for successful attack upon uveal tissue.

Among other questions which Meller propounds for investigation are the fol-

lowing: (1) Why were all previous inoculations of tissue from eyes enucleated because of sympathetic ophthalmia into animals sensitive to tuberculosis negative, whereas the germs cultivated from the tissue upon laboratory medium showed typical development in these animals? (2) Why is the proliferative form of uveitis especially apt to produce involvement of the uvea of the second eye? W. H. Crisp.

DEFINITIONS OF BLINDNESS

There is a popular impression that everyone knows what blindness means; as Dogberry believed, "to write and read comes by nature". But those who deal with the blind know there are among those called blind amounts of vision that vary from absence of all light perception, up to a quite useful ability to recognize objects at some distance. In deciding whether a certain individual is blind enough to claim benefits, accorded to the blind by charity, or legislature, it is often necessary to fall back on a legal interpretation; and decide that such a person is, or is not blind within the intention of the law.

Total blindness, loss of all light perception, is entirely different from economic blindness—inability to perform any work for which sight is essential; or from educational blindness—too blind to read the ordinary school books used by children. It has been attempted to fix the limit of blindness at a certain fraction of full visual acuity at a distance, at less than 6/60 or 1/10. But to ignore the field of vision and the light sense, admits grave confusion and injustice.

In discussing the certification of blindness N. Bishop Harman, of London (The Medical Officer, Dec. 24, 1932), who has done much to prevent blindness and assist the blind, mentions three cases that illustrate the practical difficulties encountered. A woman with chronic glaucoma, V. = 6/9; but with field limited to 5° from the fixation point, can read when she can find the place; but cannot walk without being led, and cannot see to shake hands with a visitor.

A country parson, with central senile choroiditis, and V. = 0, but a good peripheral field, has complete freedom of movement, and knows his prayer-book; and so goes about and performs all his parish duties. A volunteer officer with retinitis pigmentosa, had full vision and good fields, by daylight; but had to be led when marching at night.

Organic blindness due to ocular lesions can be recognized or excluded with certainty. But psychic blindness, as illustrated by "shell shock", and hysteria, may puzzle or defeat the most experienced diagnosticians. Seeing is done, not with the eye but the brain. The great mass of cerebral convolutions, that have developed with accurate macular vision, explains the enormous influence of vision upon all our consciousness; and suggests the possible influences of cerebral function upon vision.

Perhaps the broad practical definition for blindness is important deficiency of useful vision. In schools for the blind it is recognized that a large proportion of children have some sight. Harman says, "where there is no full provision for children with defective sight, and no choice between the elementary school and the blind school, it is inevitable that border-line cases will be drafted into the blind schools. The certification of blindness in children can rarely be final. It should always be recognized as provisional and subject to revision". No sharp and permanent line can be drawn between blind and seeing, either by a formal definition, or a scientific test; and it is not desirable that there should be such a discrimination.

The majority of those called blind can find satisfaction and usefulness, in the exercise of the remnant of vision they do possess. The most that can be done for them is to help them keep and use what sight they have. When it becomes necessary to discriminate between the seeing and the blind, for purposes of education or care, each case should be carefully studied for itself; by a person trained and experienced for such examinations, both as to ocular conditions present, and as to other abilities and surroundings. Each blind person pre-

sents a particular problem. Definitions we must have; but no definition can take the place of careful, intelligent study of the individual case, in its different aspects. Edward Jackson.

OCULAR TUBERCULOSIS

For many years, in European clinics, tuberculosis has been regarded as a major etiological factor in the production of diseases of the eye. Practically all observers agree that ocular tuberculosis is more prevalent in Europe than in the United States. But sufficient attention has not been paid in this country toward the elimination of tuberculosis as an etiological factor in diseases of the eye, particularly those of the anterior segment and uvea. When proper investigations are carried out, one will often be astounded to find that the incidence of ocular tuberculosis in his private practice is much higher than he had anticipated.

One of the difficulties associated with the diagnosis and treatment of tuberculosis of the eye has been the eye physician's lack of understanding and fear of the use of tuberculin. When tuberculin treatment or diagnostic measures are carried out by the specialist in tuberculosis at the eye physician's request, the patient is put to an unnecessary amount of expense and inconvenience in having to visit the two physicians for each observation. There is absolutely no reason why the treatment and diagnosis of eye infections with tuberculin should not be done by the eye physician if he will observe certain precautions.

First of all, it must be remembered that those patients exhibiting tuberculous lesions of the eye rarely have an active pulmonary tuberculosis. But in order to be sure that tuberculin is not used upon a patient where active tuberculous lesions other than those in the eye may be present, each patient should have a thorough examination by the specialist in tuberculosis before diagnostic tuberculin tests are made by the eye physician. If the temperature chart, x-ray photographs, and other examinations of the tuberculosis specialist show no active foci then the eye physician may proceed without fear of doing harm.

Consensus of opinion still seems to favor the use of old tuberculin for diagnostic purposes, administered either intradermally or subcutaneously. Gifford, in his book on ocular therapeutics, gives detailed information as to the preparation of dilutions. Unless the retina is involved, it is safe to start with a first diagnostic dose of one ten thousandth of a milligram of old tuberculin. A local reaction at the site of injection and a temperature reaction would make one suspicious that the ocular lesion might be due to tuberculosis, but when a focal reaction is produced in the eye itself, the evidence is conclusive. Even in the diagnostic procedure it is safer to start with small doses, and any dose should definitely not proceed beyond that which produces the slightest focal reaction. If diagnostic doses up to one milligram are given without either a local or focal reaction, tuberculosis as a cause of the eye lesion may be eliminated.

Authorities differ widely when considering the type of tuberculin to be used for treatment. Gifford thinks the majority opinion still favors old tuberculin, and certainly satisfactory results are obtained in many cases with it. Schieck in a recent monograph, which is well worth reading by anyone interested in the treatment of ocular tuberculosis, states that at the clinic in Würzburg the bacillus emulsion has been used for many years. He thinks it less likely to provoke unfavorable reactions than old tuberculin, and the end results are just as satisfactory. He recommends an initial therapeutic dose of 0.1 cc. of a 1:10,000 dilution. Succeeding doses are increased progressively by 0.1 cc. until 1 cc. of a 1 to 10 dilution is reached. He advises treatment every other day with the smaller doses, cutting the time down to twice a week as the dose increases. Some observers desire an interval of at least two days or longer between doses, in order to avoid giving the next injection during the negative phase of immune reaction. This appears logical, and certainly it is

better to have a longer period between doses than too short a one.

The controversy concerning the type of tuberculin to be used is considered by Schieck as follows, "In my judgment the dose of the injection is the main point, for much more depends upon what concentration one chooses than which tuberculin one injects."

If a focal reaction is produced at any time during the treatment, one drops back to a smaller dose and again increases it gradually. Schieck states that in the Vienna clinic as directed by Meller, tebe protein is used. This is milder in its effect than even the bacillus emulsion, and may be used in cases where the bacillus emulsion is not well borne. At the Würzburg clinic Schieck has never seen irreparable damage produced in an eye by the use of tuberculin.

In this monograph, in addition to tuberculin therapy, emphasis is placed upon hygienic and dietetic measures for the patient, similar to those used in the treatment of pulmonary tuberculosis. Ultraviolet radiation used locally is usually unable to penetrate to the lesion because of its depth, but used as a general measure may be considered beneficial. In tuberculous iritis and uveitis, Stock recommends twenty percent of a skin erythema dose of x-ray to the eye, not to be repeated in less than six weeks. The stimulation thus produced may lead to a beginning of the healing process.

Schieck has observed that in certain cases hemorrhages into the anterior chamber are followed by beneficial results, and attributes them to antibodies carried in by the blood. He goes so far as to advise the injection into the anterior chamber of fresh blood drawn from a vein in tuberculosis of the iris.

Experience would seem to indicate that the focal reaction produced by an overdose of tuberculin where the disease is limited strictly to the cornea may, after the inflammation subsides, produce a beneficial affect, but focal reaction produced where the uvea is involved causes a definite setback in the healing process, and increases the period necessary for treatment. To be on the safe side it is wise to observe the general rule of avoiding the production of focal reactions. The use of small, gradually increasing dosages, over a a longer period of time will in the end give the best result.

The recent work of Urbanek in isolating the organism of tuberculosis from the blood of patients affected with tuberculosis of the eye, and the culture by Meller of the organism directly from an enucleated eye, would tend to indicate that in some cases ocular tuberculosis is caused by the localization of the organism itself in the eye. In other cases sensitization of the eye to tuberculous toxins arising from foci located elsewhere in the body, may be the cause of the inflammation. Either type of inflammation should be amenable to treatment by tuberculin which the eye physician, observing proper precautions should not hesitate to administer.

M. F. Weymann.

OCULAR IMAGES

It has long been known that with eyes of high refractive differences such as monocular aphakia, binocular single vision is a rare occurrence. Disregarding the prismatic effects introduced by correcting such a pair of eyes, the inability to use them together is explained by the disparity in size of the two retinal images. The image formed by the correcting lens on the retina of an aphakic eye may be as much as thirty percent larger than the image in the fellow normal eye. In this case, the focal length of the lens system of the normal eye is the shortest and the image formed consequently is the smallest.

An exaggeration of this idea may be obtained by considering the use of the telescope. Viewing a distant object with one eye through a telescope will produce a larger image on that retina than the image on the other retina, and it is easily understood that fusion under such a circumstance would be impossible. Besides this overall size difference, vertical or horizonal magnification or even more complex variations in size and shape can be demon-

strated. This telescope idea pertains only to the dioptric function of the eye and is referable to the image that is cast on the retina.

Furthermore, it is conceivable that the mental interpretation of such an image is dependent upon the distribution of retinal elements, and if the extremities of the binocular images fall on corresponding retinal points the object will appear alike in the two eyes. Hence, there is the term "ocular image" in distinction to "retinal image", the first really referring to a brain image. It is this brain image with which we are primarily interested, for this is sight itself. The superimposing of the two brain images seems to be the very essence of that vague phenomenon—fusion.

It is only lately that the threshold for detecting size differences of ocular images in the two eyes has been determined to be one-fourth of one percent, that three percent differences account for many hitherto unsatisfied refraction cases, and that a five percent difference represents the border-line of fusion. At the Dartmouth Medical School Department of Physiological Optics, Professor Ames and his group are making an admirable study of the problems involved in this concept. Recently their work was presented to ophthalmologists in the Archives of Ophthalmology, 1932, v. 7, April, May and June, and although it is technical, still it is of such importance that we cannot afford to disregard the progress of these investigations.

The first application of the study of the relative size of ocular images is in the fitting and prescribing of glasses. Examples of cases not made comfortable with the glasses ordered after an examination by the usual methods are described. Differences in the relative size of the ocular images were found in these cases and after the correction of this defect, comfort was attained. The ocular image size may be controlled by special "size" lenses.

Of much importance is the relation of this study to strabismus. It is obvious, from the connection between fusion and ocular images, that for fusion to be present the images must approach one another in size and shape. It is being found in cases of strabismus that the difference in the relative size of images in the two eyes is over five percent; in alternating strabismus, when the images have been made alike, fusion was promptly accomplished. Furthermore, in these cases dominancy could be alternated from one eye to the other by varying the image size.

The study is profound and includes muscles, the horoptor, retinal-slip, stereopsis, in fact the parts of the whole are so intimately interrelated that knowledge of any one part alone is inadequate and may lead to erroneous conclusions. The subject is a worthy one, and the group at Dartmouth should be commended for their scientific investigations. H. Rommel Hildreth.

DISPENSARY OPTICAL SHOPS

The best method of handling the prescriptions for glasses ordered for clinic patients has been a debatable matter for many years. When a clinic is small, the customary method has been either to send the patient with the prescription to a retail optician in the same city or to take measurements for frames and order the lenses and frames from a wholesale optician and then adjust the frames to the patient in the clinic at a later visit. In large clinics these methods are unsatisfactory. Regarding the former of these procedures, one objection is that control of the patient is lost when he is given the prescription and sent out of the clinic. In many cases the patient does not go to the designated optician, in other cases he simply disappears. Another difficulty is that upon his return to the clinic with the glasses, certain minor adjustments are necessary and for these he must make a second trip to the optician. In short, the cooperation between clinic and outside optician is not sufficiently close.

Adjustment of frames is a nuisance to the ophthalmologist. Consequently he wishes to rid himself of this part of the work and therefore handling the prescription by ordering through a wholesale dealer is abandoned as soon as possible in favor of some other method.

To obviate these difficulties the next step is to place a representative of the optician in the clinic to take the measurements, exhibit the frames and make adjustments after the lenses have been ground and put in the selected frames. The optician may handle the finances of the transaction or this may be done by the clinic. This method has been found to be reasonably satisfactory though it possibly involves a little delay. Probably the principal reason for giving up this practice in favor of an optical shop on the premises is not one of convenience, though this is an important factor, so much as it is the possibility of conducting a shop at a profit for the benefit of the institution with which it is connected. The same objection may be raised to an optical shop managed thus as to the clinic itself and to the dispensing of drugs in the clinic, namely that the former is in competition with private physicians and the latter with pharmacists. This is true where clinics cease to be for the benefit of those only who cannot afford to pay a physician's or pharmacist's or optician's lowest fees. The chief danger is that of inclusion of patients who could pay sufficient for glasses to constitute a profitable transaction for the retail optician. Of such patients may be the hospital employees and their families, the medical school students (if there is a medical school associated with the clinic), the associated university professors, their families, and so on. When shops supply glasses for such patients as these, they undoubtedly enter into competition with the optician. To avoid this is very difficult and yet most important. Such competition, furthermore, is scarcely fair, since these optical shops usually benefit from low rental because located within the clinic building.

On the other hand clinics which are available for only those patients who cannot be profitably handled by a physician and who cannot afford to pay sufficient for glasses to assure a profit to the retail optician are justified in conducting optical shops for the benefit of the patient and the clinic. The importance however of safe-guarding the non-refracting optician so that the optical shop shall not be utilized to his detriment is an important obligation for these clinics. Such clinics as these are maintained at an annual loss and any profit from the optical shop is used for the purpose of partly making up the deficit of the conduct of the clinic.

The question of optical shops connected with clinics for patients other than indigent, presents an entirely different problem which it has not been attempted to consider in this editorial.

Lawrence T. Post.

BOOK NOTICES

Transactions, Section on Ophthalmology, American Medical Association, 1932. Cloth, 408 pages. Illustrated. Chicago, A.M.A. Press.

This volume presents, in the usual form, the papers and discussions offered at the annual meeting in New Orleans, May 9-13. The lists of former officers and members of the Section in the last five years, with their addresses and years of attendance, have been brought up to date. The Proceedings of the Section, with papers and discussions that were there presented, occupy 362 pages. The reports of committees take up 15 pages; and the list of members and index take 44 pages. The illustrations in this volume include two color plates, showing rare fundus conditions, ten pages of Bedell's photographs, showing appearances of choroidal hemorrhage, photographs of 17 cases of repair of eyelids, graphs, charts and tables; and 57 illustrations in the text.

The presession volume of this section contains the papers presented at the meeting, and these make it a volume worth preserving. But beside their better shape for library use and reference, these Transactions contain certain important features that the earlier volume lacks; such as the President's Address, the account of new instruments shown at the meeting, and the discussions elicited by the presentation of the Papers. The discussions often are quite as valuable as the papers that draw them. In this volume a paper on "Urinary Proteose in Ocular Allergy" tells of a case of massive exudate

in the vitreous, concluding thus: "This patient was brought from blindness to full visual function solely by the hypodermic use of her own urinary proteose, and this, in our opinion, takes a fitting place among the many miracles of modern medicine." But of those who joined in the discussion, one reporting on eight cases said, "Improvement has been noted in four cases." Another said: "Its use is still, to an extent, empirical". The third said: "The authors built up a beautiful theory for which they have no substantial evidence". Another pointed out: "The higher proteoses are toxic; they inhibit the coagulation of the blood and can cause febrile disturbances and mild inflammatory reactions, and even death, in experimental animals". One who has done much laboratory work on allergy said: "It therefore appears to be impossible, from such rudimentary knowledge, to draw conclusions so sweeping as those presented today". Of the nine who took part in the discussion no one could say anything more favorable of the treatment than: "Let us give it a trial".

The judgment of the profession expressed in discussion, is an excellent corrective for the over enthusiasm of the discoverer, or proposer, of a new remedy. Many of the papers presented in this section are published in the Journal of Amer. Med. Assoc. But, so far, only five of those presented last May have yet appeared in its columns. The Transactions of the Section should be more widely read by ophthalmologists.

Edward Jackson.

Pacific Coast Oto-Ophthalmological Society, Transactions 1932. Paper, 8vo., 124 pages, 25 illustrations. Published by the Society, 1932.

This volume was edited by the Secretary-Treasurer, Dr. J. Frank Friesen, of Los Angeles. Before it could be printed and sent to the members, he had died in one of the hospitals he had served, September 8, 1932, at the age of fifty-one years. The meeting, to the success of which he had contributed much, may well be his best memorial. Of the 363 members, one hundred attended this meeting, coming from points as widely separated as Montana, Utah, Arizona, and Honolulu, Vancouver, B.C., and San Diego. The Society gained at this meeting thirteen active and twelve junior members. The latter class includes those who are otherwise eligible; but have not yet obtained certificates of either of the examining boards.

The work of the Pacific Coast Society is devoted to both Ophthalmology and Otolaryngology. But in this volume about two-thirds of the space is given to subjects bearing upon ophthalmology. A paper by Dr. F. A. Plum, of Honolulu, on "Compound depressed skull fracture with loss of brain substance", with the discussion it evoked, occupied about twenty pages. The discussion was carried on by both ophthalmologists and otolaryngologists, and serves to illustrate the broad relations that connect these with all branches of medicine and surgery.

The paper of John E. Weeks, on "Treatment of Corneal Infections", brought together the practical outcome of many years' experience of the author, and of the profession. The case, reported by Hans Barkan, in which there was recovery from agranulocytic angina; but with blindness from ring abscess of both corneas, is an unique addition to the literature. The paper by Drs. Merrill and Oakes upon "Extreme bilateral exophthalmos", reports two cases ending in blindness and death. But they also bring out that there are 26 previous papers in the literature, describing this condition; which is certainly worthy of recognition, as a definite clinical and pathological entity, worthy of full attention and further study.

The paper on "Vision for equilibrium and orientation" seems to show, that the importance of vision in this direction has been a good deal overlooked. The moving pictures of cataract operations added greatly to the interest of the meeting; and showed that studies of this kind may have real value, in teaching and perfecting the technical details of such operations. These Transactions have a breadth of variety and originality, that make them an important addition to medical literature. Edward Jackson.

The Practical Medical Series. Eye, Ear, Nose and Throat. The Eye by E. V. L. Brown, M.D. and Louis Bothman, M.D. The Ear, Nose and Throat by George Shambaugh, M.D. and Elmer W. Hagens, M.D. 686 pages. Price $2.50. Published by the Year Book Publishers, 304 S. Dearnborn St., Chicago, 1932.

Four hundred and nine pages are devoted to the subject of the eye. A great many of the important ophthalmological contributions published during the year have been abstracted in this book. It is impossible to single out any of these abstracts for mention here. The book is a valuable one for reference and furnishes material for a quick résumé of the literature of the year.

Lawrence T. Post.

Behandlung der Netzhautabhebung mit multipler diathermischer Stichelung (Treatment of retinal detachment with multiple diathermal puncture). By Dr. K. Safar, Vienna, with an introduction by Professor Dr. J. Meller. 162 pages with 12 reproductions in the text and 3-color plates. Paper covers, price 9 marks. Verlag von S. Karger, Berlin, 1933.

This is a reprint from part sixteen of "Abhandlungen aus der Augenheilkunde und ihren Grenzgebieten". The introduction by Meller calls attention to the fact that Safar, working in Meller's clinic, began to make use of multiple diathermal puncture through the sclera and choroid in 1930; independently of Weve, whose first publication on the same method appeared in 1932. The new method yielded a greater percentage of successes than Meller himself had previously experienced, and also proved to be free from danger.

Safar recommends Lindner's method for localizing tears; describes his own operative procedure with diathermy (the high frequency current), and including the types of electrode and their application.

Ninety-five pages are devoted to a recital of case histories, six pages to a review of the results obtained, three pages to a tabulation of all the cases operated upon by diathermy, and two pages to discussion of the visual acuity obtained in eyes in which the retina was reattached.

A further chapter is devoted to the histologic findings in the eyes of two patients who had been successfully operated upon by diathermy but had died of intercurrent disease.

The method is seldom followed by complications, and there is little danger of bleeding. The operation may be repeated at the same area or elsewhere, without appreciable difficulty, if this proves necessary. Cicatrization is delicate, but slow, and it is therefore necessary to keep the eyes quiet for a long time.

W. H. Crisp.

Standard Classified Nomenclature of Disease. Compiled by the National Conference on Nomenclature for Disease. Edited by H. G. Logie, M.D., C.M., Executive Secretary. 702 pages. Price $3.50. Published by the Commonwealth Fund, 41 E. 57th Street, N.Y. 1933.

At the second International Hospital Congress held in Vienna in 1931 a special international committee was appointed to propose an international nomenclature for disease.

The nomenclature adopted has been designed primarily for clinicians. The system of classification is topographical and etiological; that is, each disease (including injury) is described and classified in the terms of the tissue or organ in which it is principally manifested; and secondly in etiological terms.

There are ten main topographical divisions. The one particularly concerning ophthalmologists is under the general designation, "Diseases of the organs of special sense".

The etiological classification has eleven subdivisions. Not all of these apply to every topographical division. The numerical designation consists of two parts connected by a hyphen, the first part being a topographical and the second an etiological numeral.

There is a very complete 196 page index to the volume.

There are 55 pages devoted to diseases of the eye. The arrangement seems logical and apparently includes practically everything of importance. The difficulty in the adoption of such a system lies in the great mechanical undertaking involved in changing from a system already in use.

The book indicates a tremendous amount of very careful work and is a real monument to the committee which was composed of representatives from most of the important medical societies.

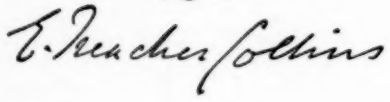
Lawrence T. Post.

OBITUARIES

Edward Treacher Collins

With the death of Edward Treacher Collins there terminated a career which

Fig. 1.



will always be recognized as symbolic of the development of ophthalmology; he will ever be regarded by future historians as one of its leaders. Many of his achievements have been recorded in the obituary notice already published (*British Medical Journal*, December 24, 1932) in which also there is an appreciation of his noble character. As one of his many pupils the writer is prompted to contribute a note on his personality, a subject which must appeal to his admirers in all parts of the world who, once having worked under him, hold his memory in affectionate esteem. In his obituary notice, amidst the long record of his achievements his former associates will read with pleasure of a regard and a popularity that are international; of his "very pretty wit in after-dinner speaking"; of a "graciousness and a quiet humor about the short speeches which he was so frequently called upon to make at ophthalmic gatherings"; how he "always seemed to be able to strike the right note, and if a story was introduced it always seemed fitting to the occasion"; of the "charm and grace of the banquet-speech which he made as Chairman of the Convention of English-speaking Ophthalmologists in 1925." Further, how he was "without any envious thought, always willing to do anything to help a colleague"; how "his heart harbored no mean thought"; that he was "the soul of honesty," "a steadfast friend."

As an undergraduate student, as a postgraduate student, and by good fortune as a friend, the writer knew him well. People meeting him found in him at first sight a man whose presence and demeanor commanded attention. Perhaps, to those who knew him not intimately, a suggestion of formality dominated his appearance—aloofness could never have been ascribed to him, reserve perhaps; but his unobtrusive and unemotional sincerity, combined with his spontaneous wit, always apposite, never failed to distinguish between autocracy and the dignity that was his without seeking.

Mr. Treacher Collins in 1894 married Hetty Emily, daughter of Lt. Col. J. L. Herrick of Hawkes Bay, New Zealand. He leaves his wife and son (who is practising law) and daughter. His elder brother is Sir William Job Collins, K.C.V.O., M.D., J.P., Consulting Surgeon to the Royal Eye Hospital, late Member of Parliament for St. Pancras and Derby, Vice Chancellor of the University of London, and Chairman of the London County Council. Mr. Treacher Collins was born in 1862.

His mother, after whose father he was named Edward Treacher, came of an old Huguenot family, the Garnaults of Châtellerault, Poitou; from the same stock came Sir Samuel Romilly, the reformer of the criminal code.

Mr. Treacher Collins' father, Dr. William Job Collins, was a remarkable personality; not only did he successfully practice physic in the northwest of London, but he exhibited on the line in the Academy (in 1859) and regularly, twice a week, hunted in pink and top boots with the Queen's Buck hounds; his son when quite young sometimes accompanied him on his pony and even after a stiff run across country was known to be among the first to come in at the finish. Mr. Treacher Collins' father was born in Oxford in 1818 and came of an old Warwick family. His great grandfather, Job Collins, built St. Nicholas Church, Warwick, and carved the reredos, the Annunciation, in the beautiful Beauchamp Chapel of St. Marys, Warwick; and a forebear, Francis Collins, wrote Shakespeare's will.

With the undergraduate student of medicine Mr. Collins was one of the most popular teachers I have known. I recall how the undergraduate prone to be deflected from ophthalmology by a display in the books of mathematical formulae which he need never employ in practice, was apt to limit his ophthalmological attentions to the well-worn examination subjects (for example, the distinction between glaucoma and iritis) by hastily learning them up in the tabular form of the textbook, to be consecutively forgotten with so many of the subjects successively crammed for examinations. But when Mr. Collins taught in the general undergraduate curriculum, whether by formal lectures or in the clinical department, the attendance was always keen. When he operated amid the restricted facilities in a general hospital he would be surrounded by an interested group of undergraduates. He was a man whose reputation was international for contributions both original and extensive; but he never used the word "I" in lectures or mentioned that many of the principles which he taught were the fruit of his own work. Nevertheless, his teaching, lucidly and logically set forth, unconsciously conveyed an impression that it had a basis in his own original observations; and it bore an unassumed finality which left the hearer satisfied to accept, without any lingering doubt, the views expressed by a man who was the scientific master of his subject. However, the undergraduate, knowing little of the postgraduate world, largely based his appreciation of Mr. Collins on his charm of exposition as well as

Fig. 2. Mr. Collins when curator at Moorfields.

on his other personal and social attributes. Besides his personality, his simplified and philosophical expression impressed the undergraduates who readily acquired many a practical lesson which they were destined not to forget. Concise and to the point, convincing and entertaining, his teaching, in conformity with his character had in it nothing of the dramatic; but side-issues, the outcome of a worldly experience, introduced with a vein of humor, anecdote and analogy, percolated his lectures and contributed to make them what they were. If, for example, on the subject of the etiology of interstitial keratitis, the student heard the details of its incidence in a well-known pack of foxhounds, he would be likely to remember for ever afterwards the possi-

bility of this disease originating from some other than the popularly attributed predominant cause. If the lecture were interspersed with first-hand accounts of things as they are in other parts of the world, its interest was the more enhanced; and Mr. Collins could draw from extensive fields, not the least interesting being that covered by his book, *In the Kingdom of the Shah*. He attracted attention and interest by plain terms, consistent similies, and humane witticisms. "Treacher's lectures" appealed irresistibly.

The students whom Mr. Collins had told that the removal of an eye consisted of three steps—circumcision, tenotomy, neurotomy—watched and remembered the operation with interest. They stored up his practical epitomies, such as the four indications for removal of an eye (to abolish disfigurement, to relieve incurable pain, to save the other eye, to save life), or, to quote only one more of many examples, the four causes of sudden loss of sight in one eye (vitreous hemorrhage, retinal detachment, arterial embolism, acute retrobulbar neuritis). The undergraduate having learned to use the opthalmoscope would be puzzled, if not disappointed, on first examining a case of vitreous hemorrhage; but he appreciated well enough when Mr. Collins had remarked that the "patient can't see out and the doctor can't see in." I remember the amusement aroused at his reply to a question—why he often asked a patient being operated on for cataract to keep the mouth open?—that it was more polite than asking him to keep it shut. His ways come to mind now—the slight forward thrust of the lower lip when he was pondering a point to be emphasized or upheld; his imperturbability; his convincing and quiet delivery. (In the obituary notice it is recorded that very frequently his remarks in a discussion were of much greater value than the paper that gave rise to them.) Throughout adult life he must have altered little, following his bent with an even tenor through years that have brought abrupt transitions and changes in the world. At forty-five his intellectuality and demeanor contributed to make him look maturely advanced in years; unchanged at sixty-five and over, he looked young. He was a figure to adorn any age, but certain mannerisms, besides something in his general bearing, shed round him an atmosphere reminiscent of all that was best of the Victorian. It was a pleasure to see him enter the hospital in the morning wearing his short-topped tall-hat—relic of a former generation, suggesting the country squire's—fresh from his ride before breakfast on the horse which he always kept, and hunted, up to the first year of the War; to hear him say, to some old cabman who complained that he could not read the numbers on the doors of the houses he drove past, or that he could not distinguish a sixpence from a half-sovereign, "tobaccer-poisoning, you must give up smoking, Sir." He never smoked himself. (An abstemious man, sparing none of his great energy, he was practically a teetotaller throughout life, yet was a good judge of a glass of port—one of the few delicacies he appreciated in his final illness.) Of ordered habits, he was punctual to the minute. A former chief clinical assistant once said that if ever he got to the hospital before Mr. Collins, he would always be forestalled next day. Mr. Collins had time to come down to the hospital of an evening specially to show an undergraduate how to freeze, bisect, and mount an excised eye. Thus, and by many other characteristics, was their teacher's influence felt by the undergraduates who passed through his hands.

He was the same to those to whom he became "Treacher Collins" of postgraduate ophthalmology, while their broader acquaintance with the subject enabled them to appreciate the delicacy and ingenuity of his imaginative genius. He delighted in correlating theories evolved from his own researches with existing biological and medical principles, displaying a finesse which, though picturesque and harmonious, never lacked scrupulous accuracy and honest conviction. An apt example of his competent presentation of a speculative subject is to be found in his paper (American Journal of Oph-

thalmology, 1922) read before the Washington Congress in 1922 which he attended as the official representative of the British Government. The crowds of postgraduate students who collected round his desk in the out-patient department of Moorfields' Hospital, coming from all parts of the world, were a testimony to the universal esteem in which he was held. As with undergraduates, so with those who were advanced, he attracted an attention that was sustained without effort by the relevancy and logic of his teaching and by the prestige and broadheartedness of his personality. Those associated with him felt they had in him a staunch friend sympathetic with their ambitions. If anyone wanted encouragement he got it from Treacher Collins, who was always ready to give a note of introduction or write a helping letter, personally written, never dictated. He was a keen advocate of opportunity and scope for the younger man. He would go out of his way to assist some enthusiast, whose ambition might have made him his own enemy in the eyes of many people, "because he deserves it." He himself was always an enthusiast, welcoming the trial of any innovation. To the suggestions of others he gave generous credit. Asked why he prescribed adrenalin with the atropine drops in cases of interstitial keratitis, he said that one day when he was remarking on the lack of tendency to dilatation of the pupil, probably because the surface vascular engorgement prevented penetration of the atropine to the depth of the iris, an American student standing by, suggested the combined use of adrenalin and atropine: so he had used it since.

All these traits were the outcome of tolerance, generosity and modesty; it was remarkable to find such qualities combined in a very hard worker who had such individuality of initiative and tenacity of his own sound views. Of a quietly critical character, he was nevertheless not of a nature to have an active dislike for anybody. He has been described as conservative: his orthodoxy, his regard for established custom and tradition, carried with it no discountenance of inspiration and imagination; there was no inflexibility of outlook in Treacher Collins.

In talking of the early days of his career he told the writer that when a suggestion was put forward that he should hold the post of Curator even longer than he did, he had felt it advisable not to acquiesce because he realized that he was getting a reputation for being a laboratory worker; this is interesting when it is considered that he combined with his laboratory work a long record of extensive clinical and operative experience. It is known that

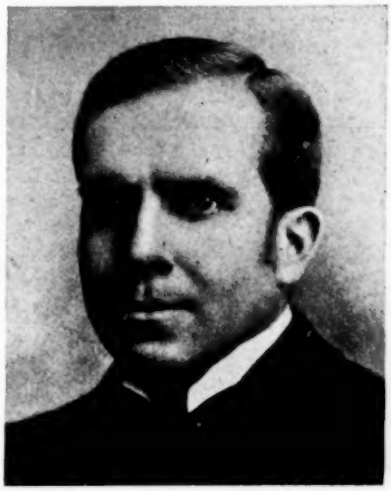


Fig. 3. Mr. Collins in middle life.

some of his earlier pathological researches were not always estimated at their just value by his contemporaries. He nevertheless pursued with equanimity and steadfastness the line which he had set for himself. Sir Thomas Barlow writing of him remarked: "He ploughed a rather solitary furrow of his own with a dignity and persistence quite notable."

A well known colleague has just written: "For the last thirty years I have never conferred with Mr. Treacher Collins without learning something from him; his mind was stored with knowledge and adorned with wisdom and was always at the service of anyone who desired to profit from it." These characteristics were not confined

to the circle of those who came within his immediate sphere. The same sympathetic broadmindedness dominated his outlook on international matters connected with ophthalmology. Those coming to his clinic from a foreign country were made welcome by Treacher Collins, no matter what their academical status.

One morning in February, 1922, when he was due to retire on age-limit from the active clinical staff of Moorfields' he walked out of a crowded department from what, after nearly forty years' service at the hospital, was his last clinical morning there. He saw his last patient and quietly left, seemingly as he had done twice a week for decades. Very few with him then realized that it was his last day there, and I shall always remember the surprise of a foreigner who was present at the unostentatious departure of the Senior Surgeon. It transpired that this was not what should have been officially his last day, for which he did not go to Moorfields, feeling that he could not face it. Those at home were thankful that his visit to the Washington Congress came so soon after, as it formed a diversion from the pain of retiring from active hospital work.

He seemed to acquire most readily by intuition (he knew little of foreign languages) an understanding of the customs of the foreign countries that he visited. With his clear foresight and broad outlook he probably did much in the years following the War to improve international relationships. Recently he related with satisfaction how he, with others, had witnessed abroad a personal reconciliation which ended a feud that had lasted for years: it is probable that he was largely instrumental in the accomplishment.

Treacher Collins' private life was one of very simple tastes. His house was decorated with oil paintings done by his father, and he himself made landscape painting one of his hobbies. The many pathology drawings which he did for his publications were largely done on a Sunday, mostly with pen and brush in India ink; where drawings of microscopical specimens were to be colored he appropriately employed dilute solutions of the stains used for the original specimens. In his student days he played rugger for his hospital and it is remembered by his contemporaries that he often exhibited his tenacity during the interhospital matches. He used to say in later life that he did not care for ball games; he did not play golf or tennis. He was interested in rose-growing at his country-house. Foreign travel appealed to him. In some respects he led a detached life and those who knew him intimately would sometimes be surprised at his lack of acquaintance with certain aspects of the outside world; but this trait in his character was offset by so intuitive an insight into the complexities of human nature that his advice was always of the greatest value to his individual friends and his services were always appreciated on any committee of which he was a member. He was an ardent and relentless worker. To those who suggested that he should spare himself he would reply "it is better to wear out than rust out", "the night comes when no man can work". Work was his delight and it was difficult to make him take a holiday. He was a little surprised at what he considered the generous way in which some of the younger men treated themselves in this respect. It was not until active hospital days were over that he was persuaded to take a holiday in early Spring when, with his daughter as companion, he made tours in South Europe which he really enjoyed; but in his enthusiasm for work he was inclined to make the tours unduly brief, to the despair of those at his home who were interested in house-renovations.

His private practice shared his interest with his research work. As was to be expected of a man of such retiring modesty, his activities were wholly devoid of publicity: his name was never before the public, though how easily it might often have been, had he so desired, can be assumed from the great number of official and distinguished positions which he was called upon to hold. His practice must have been an ideal one because he attracted to himself the staunch type of patient appre-

ciative of the philosophical enlightenment of his opinions and the unaffected tranquility of his personality; the same good-will, human understanding, and percipience that influence those who worked under him sent the patient away satisfied with his opinion. A patient resentful of misfortune who went to him for a second opinion, or for a final one of many, as to whether a seeing eye should be removed for a probably malignant growth within it, would concur with ready resignation in removal of the eye, on hearing Treacher Collins' simple consoling suggestion that it was something not to have cancer in the stomach but to have it instead in an accessible organ of which there were two. It is hard to conceive that he was overburdened with the mercurial dilettante or the pampered nouveau-riche seeking little more than the repute of having consulted him for hoped-for agreement with some popular sophistry. He greatly enjoyed practising and especially, in later years, one feature of it—seeing people who had originally been brought to him as children bringing their children to him for his advice. His characteristic kindness was only recently borne out: a most unusual and serious complication had occurred in what is ordinarily a trivial surgical case, causing the gravest anxiety to both patient and operator. Treacher Collins offered to come in and express an opinion, and when requested to accept a fee declined it on the plea that he came to assist a colleague and his patient.

The familiar and memorable figure of Treacher Collins, active to the last, will be fresh in the minds of those who attended the International Ophthalmological Congress at Amsterdam in 1929, with which he was officially connected through having been elected the first Honorary President of the International Council of Ophthalmologists newly formed at Scheveningen in 1927. Many will recall the luncheon given to the late Professor Fuchs at which Treacher Collins made one of his characteristically adroit speeches. In the preface to his book on *The History and Traditions of the Moorfields' Eye Hospital* he (agreeing that "when a medical man begins to write on the history of his subject it is a sure sign of senility") says that in early life a man has to learn history, in middle life he is engaged in making history, in his later years he becomes best qualified to write history. Those present at the luncheon to Professor Fuchs may remember that one of Treacher Collins' witticisms took the form of a paraphrase of this statement. Others who at that Congress accepted the official invitation to visit Delft may recollect how, in one of the museums, Treacher Collins responded to a request

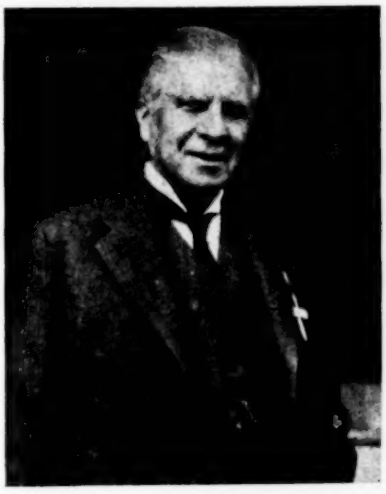


Fig. 4. Snapshot of Mr. Collins at the International Congress in Amsterdam.

to make a speech on behalf of the visitors, thanking the municipal authorities for their invitation and hospitality. It was probably not realized that the engaging speech which he made, punctuated with knowledgeable references to the history of Delft and of Holland, was entirely unprepared. Sitting at the luncheon there given he remarked that he had had no idea that he would be called upon to make any speech that day. Save that he was temporarily fatigued he looked then a man who would easily last in full activity for another ten years or more, and I was surprised at (as it now proves) a tragic remark which he then made, that he did not suppose he would survive to see the next International Congress in 1933.

He continued working hard right up to the last; in fact an inward anxiety lest he might not accomplish all that he wished to befell him in recent years, and spurred him on to efforts costly to his health. In his final illness he preserved his same patience, philosophy, humor, and imaginative outlook. He said he liked to have visitors. He made one touching complaint, that his medical attendants had told him to "rest his mind" ("As if a man of my habits could," he said). His illness came on abruptly and it is perhaps for the best that he passed away as he did rather than that he should have survived with impaired activity.

It would not have mattered what profession Treacher Collins chose: he would have enriched any with authority, leadership, and prestige. He was essentially a leader.

The Rev. Dr. Minos Devine, at the Memorial Service at the Church of St. Peter with St. Thomas, Vere Street, London, W., on December 17, 1932, said: "his strength of character enabled him to carry on his work until within a few months of his passing away. His vision never failed. His mind was never closed; he was learning to the end of his life. With a conservative temperament, his mind was alert to promote all well-considered progress in thought and practice, and that enabled him to reach the high standard that he maintained to the end. . . . He died young, because his sympathies were always fresh and his interests in life were unfailing. This surely explains his unfailing encouragement to youth, and his readiness at all times to guide inexperience. He responded to the request to occupy this pulpit two years ago to make an appeal on Hospital Sunday. I remember his reluctance to accept that invitation. It was characteristic; publicity did not appeal to him, but when he realized the help he might give, then he conquered his reserve and he forgot himself finely in his subject."

Not many professional photographs were taken of him. Of the photographs sent with this communication, Figure 2 was taken early in his career, approximately at the time when he was Curator at Moorfield's. Figure 3 was taken in middle-life. Figure 4 is reproduced from a snapshot taken at the Amsterdam Congress in 1929: in it he appears tired, but it is submitted for reproduction as it shows him in an attitude that was characteristic; this photograph bears no indication as to who took and sent it to Mr. Collins but the writer understood him to say that it had been sent from America. Figure 1 is a recent photograph; it is a better one than that which has already been reproduced in his obituary notice (*British Medical Journal*, December 24, 1932) which lacks the expression of his happiness of temperament (he was always happy) and fails to convey an impression of the supreme attribute of his character—his unfailing sympathy arising from an inherent, tolerant understanding of the fundamental side of human nature. Perhaps because of his natural unobtrusiveness, his qualities which so engendered respect and affection did not call for conscious analysis in his life; his charm was his natural self, and that sufficed. While retrospect demands a clearer picture of his noble character, even so it is not easy to analyze and set down in words the reasons beyond those of his academical attainments for the universal esteem in which he was held, even by strangers. He had an inspiring presence, a courtliness inborn, without the least vestige of pose or simulation. Fully satisfied with life, but with no evidence of self-satisfaction, he had a personality that was unique. He was an imperturbable figure of integrity and stability whose loss would have been great at any time, but is so above all in the present age. B.G.

(Received January 20, 1933).

Ernest Clarke, M.D., F.R.C.S. (Eng.)
1857-1932

Mr. Ernest Clarke, as he was known by his surgical title, died November 22, 1932. He was one of the few English writers who seemed to realize that the exact correction of errors of refraction was a very important ophthalmic service, more important than doing operations. His medical degrees came from

the University of London, and his first practical work was done in St. Bartholomew's Hospital. His first public paper was based on the administration of anesthetics in that hospital. In 1886 he devoted himself entirely to opthalmology.

In 1885 he had become a member of the Ophthalmological Society of the United Kingdom, and was its Vice-president in 1910. Of thirty clinical and practical communications made to this Society, ten referred to faults of refraction and accommodation. His first book, 1892, was on Eyestrain, commonly called Asthenopia. In 1903 he published his book on The Errors of Accommodation and Refraction of the Eye; which, within ten years went through four editions. At the International Medical Congress, of 1913, he read a paper on The Range of Accommodation. In 1914 he published an octavo of 115 pages in Dutch, a language in which he was proficient. The title was "Problems in the accommodation and refraction of the eye, a brief review of the work of Donders and the progress made in the last fifty years". Donders great work was first published in English and has never been reproduced in Dutch, or other languages.

Clarke was actively public spirited, gave important assistance to Downing College, Cambridge, where he had been a student. He served on the Management of the Royal Medical Benevolent Fund; and was an enthusiastic Free-Mason. In 1926 he was made a Commander of the Royal Victoria Order. His Atlas of Ophthalmoscopy for the Physician was published in 1931. For several years he had suffered from rheumatoid arthritis. He was Chairman of the Board of Directors of the British Journal of Ophthalmology, from 1926 until his death. Edward Jackson.

Andrew Freeland Fergus
1857-1932

Doctor Fergus died at his residence near Rothesay and Glasgow, October 24, 1932. He was a son of Dr. Andrew Fergus, a well known writer on public health. He graduated in Medicine, B.M., C.M., at the University of Glasgow in 1881; and received from that Institution the degrees of M.D., in 1891, and LL.D. in 1921. After services as hospital resident, he studied ophthalmology in Paris, and with Snellen and Donders at Utrecht. He translated, from the third French Edition, with notes from the fourth German Edition, the "Diseases of the eye" by Professor Edouard Meyer, of Paris. This translation was published in England and America, in 1887.

He became Assistant Surgeon to the Glasgow Eye Infirmary, and Surgeon to the Royal Infirmary of Glasgow; was Lecturer on Ophthalmology, and on Physics in Anderson College, and Examiner in Ophthalmology to the Royal Faculty of Physicians and Surgeons, of which he later was President. He was Ophthalmic Surgeon for West Scotland, under the Blind Persons' Act, and became President of the Scottish National Institutions and Societies for the Blind. He became a member of the Ophthalmological Society of the United Kingdom in 1888.

In connection with his early papers and his translation of Meyer's book he used the name Freeland Fergus; but after the death of his father, prefixed the initial A. His more important papers were published in the Ophthalmological Society Transactions, the Ophthalmic Review, the Lancet, the British Medical Journal and the Ophthalmoscope. He published a small manual on Ophthalmic Optics. He showed particular interest in diplopia and the operative treatment of strabismus, miners' nystagmus, workmen's compensation, and sclero-corneal trephining.

In 1906 he visited America, to attend the meeting of the British Medical Association, held at Toronto, at which Dr. A. R. Reeves was President; and contributed three papers to the Section on Ophthalmology, presided over by R. Marcus Gunn. His writings exhibited his interest in the practical applications of ophthalmology, and were always specimens of the best English. It was characteristic of him, that he was most highly esteemed by those who knew him longest and best. He deserved a higher place among the earlier workers in mod-

ern ophthalmology, than might be given to him, on account of his general professional reputation.

Edward Jackson.

Charles Abadie
1842-1932

The death of Dr. Charles Abadie occurred June 29, 1932. He had retired from active practice more than twenty years ago, but continued to attend medical societies, visited his old clinic and wrote medical articles until within the last five years. For more than fifty years he was an important figure among the ophthalmologists of Paris. Graduating in Medicine in 1868 he served as interne in Paris; and then studied ophthalmology in Vienna and Berlin, serving as assistant in the Clinic of Prof. von Graefe. Returning to Paris he became the Chief of Clinic for de Wecker; later he opened his own clinic, which grew and was subsequently located on Boulevard St. Germain. In 1876 he published his two-volume treatise on "Diseases of the eye". Although not given to devising operations or instruments, he was known as a very skilful operator.

He contributed to the literature a great many short, clinical papers, especially devoted to ocular therapeutics. He early became interested in glaucoma. He kept his preference for iridectomy, in all acute and inflammatory cases; and, for chronic glaucoma, chose miotics for the principal treatment, and sympathectomy, or trephining, if operation were finally necessary. He emphasized the importance of the sympathetic nervous system in glaucoma and in some other ocular conditions; and recommended paracarotid sympathectomy for optic atrophy. While in de Wecker's Clinic he urged the use of jequirity for trachoma. He always showed an active interest in eye conditions attending diseases of the central nervous system. He was Vice-president of the Section on Ophthalmology in the International Medical Congress held at Washington, D.C., in 1887; and read a paper on "Certain derangements of ocular motility and their treatment". He also opened the discussion of the paper by Mr. Henry Power on "Microbes in eye diseases". As a lecturer and speaker in medical societies, he was always heard with attention and interest.

Edward Jackson.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy and embryology

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6. CORNEA AND SCLERA

Ershkovitch, I. G. **On the treatment of serpiginous ulcers of the cornea with brilliant-green.** Sovietskii Vestnik Opht., 1932, v. 1, pt. 7, p. 332.

The author reports encouraging results from the use of brilliant-green in the treatment of corneal ulcers. Applied twice daily to the cocainized cornea in the manner in which tincture of iodine is used, it proved to be much superior to the latter. Of the twelve hypopyon-keratitis cases treated with brilliant-green (atropin was the only other drug used), ten responded well, while in two thermocauterization and puncture of the anterior chamber became necessary. The therapeutic effect of brilliant-green is attributed to its bactericidal power, which is higher than that of optochin and rivanol, to its depth of penetration, and to the stimulation of regenerative processes in the affected tissues.

M. Beigelman.

Gnad, Franz. **Results of treatment of parenchymatous keratitis with roentgen and Bucky rays.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 446.

At Elschnig's clinic ten cases of typical parenchymatous keratitis with positive Wassermann reaction were subjected to roentgen radiation, and the results compared with those of twenty-seven cases not treated with roentgen rays. An essential influence by roentgen radiation was not demonstrated. Roentgen-ray treatment of three out of four cases of parenchymatous keratitis with negative Wassermann but positive tuberculin reaction had neither a bad nor a favorable effect. But as tuberculous affections of the eye are frequently benefited by roentgen rays the latter deserve further trials. No favorable results were obtained by Bucky radiation in four cases with positive Wassermann reaction, and it cannot be recommended.

C. Zimmermann.

Howell, C. M. H. **Ocular manifestations of lesions of the fifth cranial nerve.** Brit. Med. Jour., 1932, Oct. 29, p. 786.

The author discusses ulceration of the cornea occurring after alcohol injection, inflammations, and removal of the Gasserian ganglion. Of 60 cases injected with alcohol, 36 had complete anesthesia of the cornea and 16 of these developed corneal ulcer. The greatest danger of ulcer is in the first week, and after a month ulcers rarely occur. The deeper structures of the eye have not been involved in this series of cases. A dose of x-rays which under ordinary

conditions produces only slight injection will produce acute chemosis in a desensitized eye. The author keeps the upper lid carefully strapped down for two or three weeks after the operation. At the first sign of ulceration the lids are stitched together. The ulcers heal, as a rule, very rapidly, but the lids are kept together from four to six months.

M. E. Marcove.

Lijo Pavia, J. **Ocular disturbances in subject with old tuberculous lesions.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, Dec., p. 653.

The author discusses from the standpoint of differential diagnosis a case of scleritis in a woman of forty-five years exhibiting in the same eye a central leucoma and a paramacular chorioretinal lesion, dating from childhood and adolescence. In the neck and temple were scars from suppurative cervical adenitis. While all the old lesions were regarded as undoubtedly tuberculous, the scleritis was considered as a focal infection, in view of the twenty-five years of immunity from tuberculosis, the mild corneal infiltration accompanying the scleritis, and the rapid improvement obtained. Treatment however was with tuberculin.

M. Davidson.

Prins, C. W., Jr. **Insulin salve for clearing degenerative opacities of the cornea.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 658.

A woman of fifty years came five years ago on account of progressive degeneration of the corneae, which had numerous old scars. In 1929, vision was right 1/100, left 1/4, and in 1932 it had declined to right 3/60, left 5/60 in spite of all treatment. After using an ointment of insulin 1.25, vaselin 20, lanolin 2, distilled water 2, the opacities cleared so that vision rose to 1/6.

C. Zimmermann.

Ptashnik, D. G. **On the treatment of corneal ulcers with brilliant-green.** Sovietskii Vestnik Opht., 1932, v. 1, pt. 7, p. 332.

A one percent alcoholic solution of brilliant-green was used for the treatment of corneal ulcers in fifteen cases. The eyelids were held apart for one or two minutes to facilitate drying of the stain. No ill effects were observed, and the subjective symptoms (pain and photophobia) seemed to improve promptly. Ulcers caused by staphylococcus or streptococcus appeared to respond better than those of pneumococcic origin. No conclusions could be formed as to the actual curative value of the drug. M. Beigelman.

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Gala, A. **The changes in intraocular tension after retrobulbar injections.** Oft. Sbornik, 1932, v. 7, pp. 72-80.

Prior to operation, in a series of cataracts and glaucomas, the author measured the tension of the eyes after using the following anesthetics: 1.5 to 2 c.c. of three percent novocaine or two percent percaine with and without 0.15 c.c. adrenalin (1 to 1000) in 1 c.c. of the anesthetic. The measurements were made with the Wendt and the original Schiötz tonometers. Twenty-six senile cataracts, measured after anesthesia with three percent novocaine, showed practically unimportant oscillations of tension in both directions. Eight cases of glaucoma, measured after three percent novocaine injection, showed a like result. Six cases of glaucoma, measured after percaine injection, showed slight increase in tension in four cases.

Tension was constantly lowered in senile cataract cases fifteen minutes after novocaine-adrenalin injection. In cases of normal tension, no or a slight lowering takes place in five to ten minutes after three percent novocaine. The lowering is only temporary. An analogous lowering appears under the same circumstances in primary glaucoma. Deep anesthesia with two percent novocaine-adrenalin lowers the normal tension at once to a small degree, and more after thirty minutes. Three percent novocaine-adrenalin causes a considerable lowering of tension. Immediate increase of tension after deep anesthesia was never observed. G. D. Theobald.

Gala, A. **Sympathetic ophthalmia.** Oft. Sbornik, 1932, v. 7, pp. 59-65.

In the eye clinic at Bratislava, during a thirteen-year period, there were four cases of sympathetic ophthalmia among 80,000 patients, or 0.005 percent. Case 1. Male, aged 24 years. Eleven years after the right eye had been enucleated with the diagnosis of sympathetic iridocyclitis, the left eye became inflamed. A tender, painful nodule, the size of a bean, was removed from the right socket. This was not examined histologically. Case 2. Male, aged 23 years. Subconjunctival rupture of the sclera of the left eye, accompanied by progressively increasing prolapse of the iris, was corrected by an operative measure. The eye was not inflamed, and after fourteen days the patient was discharged with vision of 6/18. Four months later, he returned with a typical sympathetic ophthalmia in both eyes. Treatment was ineffective. Case 3. Male, aged 31 years. The left eye was perforated by an iron chip. Five months later, sympathetic ophthalmia developed in both eyes, and blindness resulted. Case 4. Female. Sympathetic ophthalmia developed six weeks after cataract extraction, and progressed unfavorably in spite of enucleation.

G. D. Theobald.

Hofe, K. vom. **A typical iris coloboma, partial aniridia, and aplasia of both foveas.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 476. (Ill.)

The right eye of a man aged forty-four years showed an incomplete defect of the iris upward, the pigment border intact, with prompt pupillary reaction. In the lens were fine opacities, the disc was normal, there were numerous small lighter spots with some pigment dislocations in the choroid, and the foveal reflex was lacking. The left iris was only 2 or 3 mm. wide, the pupil quadratic, the lens and fundus as in right eye. These different malformations are attributed to arrest of development of the ectodermal parts of the eye.

C. Zimmermann.

Kadlicky. **Essential atrophy of the iris.** Oft. Sbornik, 1932, v. 7, pp. 68-71.

(This is the first of the two cases reported by Klauber.) Three years after the patient, a woman of twenty-four years, had noticed the onset of iris atrophy, the pupil was eccentric, and the iris stroma had almost completely disappeared, while the pigment layer remained intact. Vision was 6/12. The tension was increased, the disc cupped. After an Elliot trephining, the eccentricity of the pupil disappeared, but the atrophy and glaucoma remained. The vision decreased and defects appeared in the pigment layer. The glaucoma is here the result of the essential atrophy of the iris. G. D. Theobald.

Klauber, E. **Spontaneous atrophy of the iris.** Oft. Sbornik, 1932, v. 7, pp. 66-67.

(This is the case reported by Kadlicky.) Klauber also describes atrophy of the iris in an old man in whom cyclodialysis was done for relief of tension following traumatic luxation of the lens into the vitreous.

G. D. Theobald.

Levy-Wolff, Lizzie. **The genesis of "benign epithelial proliferation of the ciliary body" (Fuchs).** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 593. (Ill.)

The author reports her observations on fifty-eight cases. This benign proliferation produces no clinical symptoms and is only accidentally discovered. Generally it is roundish oval or kidney-shaped, of a diameter rarely larger than 1 mm. Its usual seat is the edge of a ciliary process, and it develops between two layers of the unpigmented epithelium which covers it and separates it from the posterior chamber. It grows toward the vitreous. As it lacks stroma it is not a real neoplasm but probably a hyperplasia. It may be caused by increased activity of the ciliary processes, as in anomalies of refraction, or it may be congenital. It is not a senile change, but also occurs in young individuals. C. Zimmermann.

Schreiber, Ludwig. **The retinal changes in the second eye from sympathetic ophthalmia.** Graefe's Arch., 1932, v. 129, p. 127.

In a woman of sixty-five years, considerable inflammation followed extraction of a cataract in the right eye; and a discission operation three and one-half months later was immediately followed by intense pain and glaucoma. The unoperated left eye developed iridocyclitis six months after the first operation on the right eye; and secondary glaucoma made enucleation of the left eye necessary nine months after the first operation on the right eye. The inflammation of the right eye quickly subsided, one year later another discission was performed, and two years later, the corrected vision was 5/10 part. Microscopic examination of the enucleated left eye disclosed only infiltration of the uveal tract with lymphocytes; but pronounced retinal degeneration affecting mostly the ganglion cells with frequent complete disappearance of the rod and cone layer, and periphlebitis and periarteritis. H. D. Lamb.

8. GLAUCOMA AND OCULAR TENSION

Butler, T. H. **Iridencleisis and trap-door iridectomy in the treatment of glaucoma.** Brit. Jour. Ophth., 1932, v. 16, Dec., p. 741.

In 1926 the author presented a report of fifteen patients upon whom iridencleisis had been performed. Believing the operation ineffective, he returned to trephining. But one or two tragic results by this method made him feel that he must give iridencleisis another trial. Subsequent experience has convinced him that this is the operation of election. The full effect is not always apparent until after a month or more, during which period the use of pilocarpin and massage may be necessary. The disadvantages of the trephine operation include the serious insult to the eye, late formation of the anterior chamber, postoperative cataract, possibility of late infection, and occasional hypotony. The only real objection to iridencleisis is that its effect is apt to be slow. The total number of cases reported is sixty, of which ninety percent were successful. By the trephine method the author's acute cases showed fifty-four percent successful and in chronic cases seventy percent. In cases requiring iridectomy the author does his trap-door operation, trephining in the usual way except that the disc is left hinged above, the iris prolapsed, iris is snipped off and the disc is replaced. D. F. Harbridge.

Clark, J. H. **A method for measuring elasticity in vivo and results obtained on the eyeball at different intraocular pressures.** Amer. Jour. of Physiol., 1932, v. 101, Aug. 1, p. 474.

This is a technical article. When glaucoma is associated with relatively normal intraocular pressure the eye may have a coefficient of elasticity greater than normal, and a high coefficient of elasticity may be a factor in the etiology of glaucoma. (Three references.) Ralph W. Danielson.

Coppez, J. H. **Treatment of secondary glaucoma by instillations of adrenalin.** Bull. Soc. Belge d'Opht., 1932, no. 64, p. 44.

One patient had a violent attack of serous iritis with numerous fresh synechiae and manifest hypertension. The other, seventy-nine years old, had lost one eye from glaucoma and had hypertension and beginning loss of vision in the other eye. In both cases instillations of concentrated adrenalin reduced the tension. In discussion Hambresin highly recommended application of leeches to the temple.

J. B. Thomas.

Gala, A. **The changes in intraocular tension after retrobulbar injections.** Oft. Sbornik, 1932, v. 7, pp. 72-80. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Giannantoni, C. **Total chlorides in the blood of the glaucomatous.** Lettura Oft., 1932, 9th yr., July, p. 319.

Forty cases were examined. Twenty had primary glaucoma and the other twenty intraocular and extraocular disease without rise in tension. Those with glaucoma showed slightly increased total chlorides, the average being 4.76

percent. The average for the nonglaucomatous was 4.61 percent. The ages ranged from fifty-four to seventy-nine years. F. M. Crage.

Hofe, K. vom. **The action of tenosin on the pupil and intraocular tension.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 622.

In experiments on rabbits, tenosin promptly produced mydriasis and lowered intraocular tension.

C. Zimmermann.

Kadlicky. **Essential atrophy of the iris.** Oft. Sbornik, 1932, v. 7, pp. 68-71. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Kirwan, E. W. O'G. **Epidemic dropsy glaucoma.** Indian Med. Gaz., 1932, v. 67, Nov., p. 636.

The author describes a form of glaucoma occurring as a complication of epidemic dropsy, usually late in the disease. Hindus and Mohammedans are frequently affected, but the disease is uncommon in Europeans. The tension is as a rule very high. The anterior chamber is either normal or deeper than normal. The pupil is normal in size and reaction, the cornea steamy. Both eyes are usually affected to the same degree. The increased tension is due to edema of the ciliary body produced by toxic amines formed in rice which has been badly stored. Surgical intervention as soon as possible is indicated. M. E. Marcove.

Klauber, E. **Spontaneous atrophy of the iris.** Oft. Sbornik, 1932, v. 7, pp. 66-67. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Kleefeld, G. **Demonstration of perconjunctival transudation in sclerectomy for glaucoma.** Bull. Soc. Belge d'Opht., 1932, no. 64, p. 39.

In 1920 Seidel first reported his method of demonstrating transudation through the conjunctiva covering corneoscleral trepanations. This consisted in placing over the filtration scar a drop of a solution of fluorescein and observing the trail of color caused by its overflow. Kleefeld's method uses powdered uranin, a sodium salt of fluorescein, a very small quantity being deposited on the cicatrix and on several adjoining parts of the conjunctiva. If a filtering scar exists, the powder at that point dissolves instantly, and one sees the solution ooze promptly to the corneoscleral border. The separate, discrete stains on the conjunctiva demonstrate that the liquid that flows from scar to limbus emanates from the filtration scar itself and not from tears that have flowed over the scar. J. B. Thomas.

Saint-Martin, de, and Mériel, P. **Glaucoma and mean tension.** Arch. d'Opht., 1932, v. 49, Nov., p. 705.

One table shows intraocular tension, type of glaucoma, average, minimal, and maximal arterial tension, and venous pressure in ten individuals whose minimal pressure was difficult to fix exactly, but whose average tension was above normal. Minimal tension was increased in seven cases and maximal tension was increased in three cases.

M. F. Weymann.

9. CRYSTALLINE LENS

Bunge, E. **Clinical contributions to the pathology of the lens.** Zeit. f. Augenh., 1932, v. 79, Nov., p. 5.

The cataractous lenses of five patients are described. In one patient, lamellar cataracts were observed before and after an interval of eleven years, in which time great shrinkage had taken place. A clear central window in the cataract made it possible to see a nuclear cataract whose contours were almost precisely parallel to the margin of the window. In a second patient an axial bandlike cataract of the anterior peripheral nucleus was seen. In one patient with electric cataract the opacities were subcapsular, with a peculiar festooned edge. In a patient with senile cataract numerous crystals were seen, and in a fifth patient the two eyes presumably demonstrated two entirely different stages in the development of cataract. F. Herbert Haessler.

Custodis, Ernst. **Epithelial lining of the anterior chamber.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 612. (Ill.)

Custodis describes in detail such a case, after cataract operation, in a woman aged sixty-seven years. The diagnosis was made clinically and was confirmed by microscopic examination after the eye had been enucleated on account of persistent irritation and the danger of sympathetic ophthalmia. The fistula lay at the contact of the temporal end of the iris with the wound. The proliferation of the epithelium may take from three weeks to several months. In any case of hypertension after cataract operation the possibility of epithelial migration into the anterior chamber must be thought of.

C. Zimmermann.

Frenkel, H., and Dejean, C. **Anatomic, etiologic, experimental, and clinical study of rupture and detachment of the zonule.** Arch. d'Opht., 1932, v. 49, Dec., p. 753.

Rupture of the zonule is the commoner form of lesion produced by injuries displacing the lens. The article is divided into six parts: history, embryology and anatomy, etiology and pathogenesis, experiment, clinical study, and summary. The zonule is considered as a portion of the primitive vitreous with a lamellar structure reenforced by fibers. Traumatism is more likely to rupture it at the attachment to the lens than at its insertion into the ciliary body. After dilatation of the pupil with atropin, detachment of the zonule is easily recognized with the biomicroscope, as the zonular remains are clearly seen attached to the equator of the lens. M. F. Weymann.

Miklós, Andor. **Culture of bacteria in lens substance.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 481.

Lens substance removed by cataract extraction was inoculated with different bacteria, and their growths compared with those on other culture media. Lens matter was found to be one of the best culture media, so that cortical matter may play a very important part in infection. C. Zimmermann.

Peters, A. **Remarks on the genesis of several forms of cataract.** Zeit. f. Augenh., 1932, v. 79, Nov., p. 1.

The influence of heredity in the origin of certain cataracts has been stressed too lightly. The variations in time of onset and in form of many of the partial stationary cataracts may be explained by assuming that the central portions of the lens have a shorter functional life than the cortex and that the substratum for this is present in the germ plasm. The author elaborates this hypothesis by considering a few well known clinical pictures.

F. Herbert Haessler.

Traquair, H. M. **Notes on new instruments and technique in cataract operation.** Trans. Ophth. Soc. United Kingdom, v. 50, pp. 564-567.

For anesthesia and akinesia the author uses a solution of two percent novocaine, one percent potassium sulphate, and one-eighth percent cocaine hydrochloride with a few drops of adrenalin. A simple flexible speculum has a bar which elevates the upper lid. Intracapsular extraction is done with forceps of any design, using a small strabismus hook for expression.

Harold F. Whalman.

Van Lint. **Concerning extracapsular versus intracapsular extraction of cataract.** Arch. d'Opht., 1932, v. 49, Nov., p. 689.

In 1900 the writer was taught to operate by instillation of cocaine, section of the upper two-thirds of the limbus with a Graefe knife, optional iridectomy, discission, and expression of the lens by pressure upon the globe. He traces step by step the departures from this classical procedure which have led him to the technique which he now uses. His present operative procedure of choice includes: akinesia by injection of novocain along the outer orbital border; injection of novocain into the orbit; conjunctival flap dissected up from the temporal side of the globe, under which flap an incision is made with a keratome in the three o'clock meridian at the limbus, and enlarged with scissors; peripheral or total iridectomy;

placement of two sutures in the conjunctival flap; in individuals over sixty years of age intracapsular extraction by suction method; in others extracapsular extraction. M. F. Weymann.

Vogt. Alfred. **Clinical and histological comparison of senile and fire lamellae of the anterior lens capsule.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 587.

In senile exfoliation the axial area of the anterior capsule, corresponding to about two-thirds, seems to be exclusively affected. Likewise the lesion of the capsule in fire-workers is not merely peripheral, but above all axial. It differs from the senile exfoliation by its size, single layer, greater continuity, and lesser brittleness, and most of all by its occurrence at a more youthful age, about two decades earlier.

C. Zimmermann.

Vogt, Alfred. **Further histologic findings in senile exfoliation of the anterior capsule.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 581. (Ill.)

Eyes with senile exfoliation of the anterior capsule, in patients who had long been under observation, were enucleated immediately or a few hours after death, hardened in formalin, imbedded partly in paraffin partly in celloidin, and examined histologically. Most likely the processes in the depths and on the surface of the capsule are identical—disintegration and dissociation of the lamellae, with secondary entrance of aqueous which accelerates their maceration and decay. The constantly moving iris sweeps into the anterior chamber the exfoliated material, which is not easily absorbed and hence obstructs the outlets, explaining capsular glaucoma. C. Zimmermann.

Vogt, Alfred. **The histology of the normal zonular lamella.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 577. (Ill.)

Equatorial sections of five fresh normal eyeballs made the detached zonular lamella easily visible. It was very thin, a small fraction of the thickness of the capsule. Without exception it showed a fine uniform striation parallel to the equatorial lens fibers, lying in meridional planes, like the zonular fibers to which it probably belongs genetically.

C. Zimmermann.

10. RETINA AND VITREOUS

Anderson, J. R. **Anterior dialysis of the retina: disinsertion or avulsion at the ora serrata.** Brit. Jour. Ophth., 1932, v. 16, Dec., p. 705.

This, the second part of the author's contribution, discusses signs and symptoms, and prognosis, with clinical reports and many illustrations. The author concludes that anterior dialysis is a special form of breach of retinal continuity, probably occurring immediately behind the ora serrata, and seen most frequently amongst relatively young patients; that the actual cause of anterior dialysis, apart from obvious cyclitis and severe trauma, is obscure; and that Gonin's treatment gives reasonable chance of cure.

D. F. Harbridge.

Arruga, H. **Personal experience in the treatment of retinal detachment and a description of recent surgical procedures.** Arch, de Oft. Hisp.-Amer., 1932, v. 32, Nov., p. 614.

Between June, 1928, and June, 1932, Arruga had dealt with 203 retinal detachments, not counting thirteen due to tumors and other special causes, and, aside from four Lagranges, had operated on 164 of them by the newer procedures. Cure with vision of 2/10 and better was secured in forty cases, and reattachment with vision of less than 2/10 in thirteen more. A cure is considered permanent after three months, and only four relapsed after that interval as a result of more or less intense trauma. Some cases required more than one operation, some as many as seven, to effect a cure. Twenty-five of the operated cases had previously lost the other eye from detachment. Tears, found only in fifty percent at first, are now seen in ninety percent of the cases. They were not found in thirty-two cases and the percentage of failures was much higher in this group. The majority of tears were in the equatorial and

upper temporal zone, disinsertions almost exclusively below and mainly temporal, frequently bilateral, and chiefly in the young. Accompanying lesions were: myopic degeneration, 136 of the 164 cases being myopes, with only fifty percent among the aged; peripheral choroiditis in twenty-five percent of the cases and frequently situated near the tear; and occasionally disseminated choroiditis. Aphakia gave an unfavorable prognosis. Favorable factors are: youth and good general health, recentness of detachment, small size of tear and detachment, absence of intraocular inflammation, and ability of the patient to keep quiet. The Guist-Lindner scleral trephining procedure, described and illustrated in detail, was employed by Arruga in twenty-eight cases with approximately the same results as from the Gonin method. Five percent soda is preferred to the potash stick since it does not demand the instantaneous neutralization which potash does. Fewer holes are made by Arruga of late, and the untrephined portion is reached for cauterization with a one percent soda solution through the holes made, by means of a lacrimal canula. Diathermy, which is reviewed, described, and illustrated, has been done by Arruga only on animals.

M. Davidson.

Aust, O. **Vessel shadows as a new symptom of detachment.** Graefe's Arch., 1932, v. 129, p. 17.

In many cases of retinal detachment, the only definite diagnostic symptom may be sharply limited shadows cast by the bloodvessels in the elevated retina upon the underlying pigmented epithelial layer. This shadow phenomenon, not previously described, is not found in every case of retinal detachment. The author observed this condition in two cases of recurrent detachment after good results from the Guist and Lindner method. In both patients the shadow phenomenon remained unchanged for months. The shadows from the retinal vessels are more likely to be detected when as small as possible a source of light is directed straight into the anterior focal point of the eye and when the axis of observation and the axis along which the light travels form with each other as large an angle as possible.

H. D. Lamb.

Baquis, M. **Relapsing hemorrhages of the vitreous and retina in adolescents.** Lettura Oft., 1932, 9th yr., July, p. 330.

The various causes are discussed, and the literature reviewed. The author describes a case of relapsing hemorrhages observed in a male aged eighteen years. The hemorrhage in the first eye occurred twenty-four hours after the entrance of a small metallic foreign body into the inferior fornix and its removal. This eye became totally blind with retinal detachment and retinitis proliferans. The second eye, whose vision had been reduced to 1/15 as a result of similar hemorrhages, returned to normal after one month of treatment, but within two years, after recurrences, this eye also became blind. The only positive findings were mitral stenosis, polycythemia (6,000,000), and a positive Pirquet reaction. The polycythemia was explained by the cardiac condition and diaphoretic treatment. The author regards the etiology as tuberculous.

F. M. Crage.

Bartels, M. **Operative healing of detachment of the retina in spite of unintermittent miner's nystagmus.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 473.

A miner, aged fifty-two years, affected for decades with intense nystagmous, sustained a traumatic detachment of the retina. A month later the Guist-Lindner operation was performed with seven trephine holes. The retina remained reattached after four months.

C. Zimmermann.

Bein, K., and Michniewicz, L. **Is Oguchi's disease exclusively associated with the Mongolian race?** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 640.

A Polish farmer, aged twenty-three years, suffered from congenital hemeralopia, the other visual functions being normal. He showed yellow discoloration and abundant retinal reflexes in

the upper temporal quadrant and in the temporal portion of the upper nasal quadrant, and marked prominence and dark color of the arteries and veins, so that they could not be distinguished from each other; with disappearance of all ophthalmoscopic changes after being in the dark. This is a new case of Oguchi's disease with Mizuo's phenomenon outside of Japan. From this case in a Pole, Scheerer's in a German, and Edelmann's two in Jews, it may be concluded that Oguchi's complex of symptoms is not confined to the Mongolian race and is very likely a ubiquitous disease. C. Zimmermann.

Belski, A. A., and Ialin, R. I. **Pigmentary retinitis and the vegetative nervous system.** Sovietskii Vestnik Opht., 1932, v. 1, pt. 6, p. 277.

Seven patients affected with pigmentary retinitis were subjected to a thorough roentgenographic and biochemical study. The sella turcica was found to be smaller than normal and defective structurally. In the bones of the hands and feet homogeneous sclerotic areas were detected (osteopathia condensiva disseminata). The calcium content of the blood was always either increased or decreased. These findings, in the author's opinion, point toward a defective vegetative system with dysfunction of the parathyroid glands. Galvanotherapy and calcium iontophoresis are said to have resulted in improvement of the subjective symptoms.

M. Beigelman.

François, J. **The operative treatment of a case of detachment of the retina.** Bull. Soc. Belge d'Opht., 1932, no. 64, p. 57.

The detachment had occurred four months before operation. There was no history of trauma, and no myopia. Arterial hypertension and a slight uremia were present. There was ocular hypertension (50 mm. Schiötz), which disappeared after the intervention. The operation included incision of sclera and choroid over the retinal tears and galvanocauterization with especial care not to penetrate into the vitreous. There was complete restitution of the visual field and the visual acuity rose to 1/3 from counting fingers at two meters. J. B. Thomas.

Fuchs, A. **The relation between arteriosclerosis and the visual apparatus.** Rev. Oto-Neuro-Oft., 1932, v. 7, June, p. 230.

Disturbances of the visual apparatus due to arteriosclerosis are divided into two groups: (1) those dependent on local hemorrhage; (2) those indirectly produced by the sclerosis. The condition of the cerebral vascular system is usually similar to that of the retina. The fundus appearances due to various hemorrhagic disturbances in the retina are described. A. G. Wilde.

Genet, L. **Treatment of detachment of the retina by perforating diathermocoagulation.** Arch. d'Opht., 1932, v. 49, Nov., p. 710.

Regardless of whether or not a tear exists in the detached retina, the object to be achieved is to produce adhesions between the retinal and choroidal membranes. This may be most easily accomplished by diathermocoagulation in the space containing the subretinal fluid. The technique is simple, requiring only the entrance of the active electrode into the subretinal space with passage of the coagulating current for two seconds. The milliamperage cannot be read in so short a time so the adjustment of the instrument used and found most satisfactory is described. One, two, or three perforations may be used. There is very little postoperative reaction such as is often found with more destructive techniques. The operative results of fourteen cases are given briefly. M. F. Weymann.

Hofe, K. vom. **Atypical iris coloboma, partial aniridia, and aplasia of both foveas.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 476. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Lepard, C. W. **Lipemia retinalis.** Amer. Jour. Ophth., 1933, v. 16, Jan., pp. 12-15..

Lijo Pavia, J. **Ocular disturbances in subject with old tuberculous lesions.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, Dec., p. 653. (See Section 6, Cornea and sclera.)

Michaux, A. **Star-shaped hemorrhagic retinitis and dental infection.** Bull. Soc. Belge d'Opht., 1932, no. 64, p. 30.

A young man suddenly lost the vision of one eye. After about a month of various treatments for the retinitis, including a brief course of tuberculin injections, the author was consulted. Examination of the eye grounds revealed an exudative retinitis with large hemorrhagic patches and a stellate figure in the perimacular region. One suspicious tooth was removed with prompt but partial improvement in vision. The extraction of a second tooth with "third degree caries but healthy roots" was followed by rapid improvement in vision and gradual absorption of the retinal exudates, leaving faint white scars.

J. B. Thomas.

Pillat, A. **Changes of the eyeground in Wilson's disease (pseudosclerosis).** Amer. Jour. Ophth., 1933, v. 16, Jan., pp. 1-6.

Zanettin, G. **Clinical research on the pathogenesis of Leber's retinitis stellata.** Ann. di Ottal., 1932, v. 60, June, p. 411.

Leber has shown that while the pathology of this form of retinitis is not known it has been recognized as an accompaniment of diseases not of uveal origin. The two cases studied by the author were unquestionably of different origins: the first secondary to toxic optic neuritis; the second following a traumatic lesion of the fundus. It was thought that the pathological changes were due to disturbances of retinal circulation in the region of the macula. (Bibliography, plates.)

Park Lewis.

11. OPTIC NERVE AND TOXIC AMBLYOPIAS

Bendescu, T. **Bilateral optic atrophy caused by pneumosinus dilatans of the right sphenoidal sinus.** Zeit. f. Augenh., 1932, v. 79, Nov., p. 41.

A woman of twenty-four years had gradually all but lost her vision. No deviation from normal could be found other than bilateral simple optic atrophy and a tremendously enlarged right sphenoidal sinus, the planum sphenoidale displaced upward, and the sella turcica back. F. Herbert Haessler.

Fazakas, Alexander. **Topography of the accessory nasal cavities, especially with regard to diseases of the optic nerve.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 524.

In examinations of more than one thousand skulls Fazakas found topographic deviations so rare that they were insignificant as to the relatively frequent affections of the optic nerve caused by diseases of the nose or sinuses. Analysis of the roentgen picture in some such affections indicated that if the optic canal was short, from 0.5 to 2 mm. in length, it never came in contact with even the hindmost ethmoidal cells, although it might with the sphenoidal sinus. Short canals further have the advantage of thick walls and freedom from dehiscences. If the canal is longer, from 6 to 8 mm., its contact with the sphenoidal sinus is more extensive and it comes into the immediate vicinity of the ethmoidal cells and sometimes of the frontal and maxillary sinuses if they extend unusually far back. The longer the canal, the thinner and more brittle are its walls. In twenty-five percent of long canals there were dehiscences toward the accessory cavities, and the lumen of the long canal is narrower than that of the short.

C. Zimmermann.

Monbrun, A., Richet, C., and Facquet, J. **Retrobulbar optic neuritis due to carbon disulphide.** Arch. d'Opht., 1932, v. 49, Nov., p. 697.

A thirty-year-old man, working as a vulcanizer of rubber, had frontal headache and progressive diminution of vision, and later complained of fatigue and loss of memory. Visual acuity was reduced to less than 1/10 in each eye,

with a large central scotoma for colors and white. The fundi appeared normal. This typical retrobulbar neuritis was due to working over a vat containing carbon disulphide, in spite of a ventilating system being used. Recovery was rapid after removal of the cause. The field changes resemble those of tobacco-alcohol amblyopia, but recovery is more rapid after removal of the toxic agent. Gas masks are suggested, and stricter regulation. M. F. Weymann.

Traquair, H. M. **Toxic amblyopia, including retrobulbar neuritis.** Trans. Ophth. Soc. United Kingdom, v. 50, pp. 351-385.

The clinical picture and the causes are reviewed. Based on the principles of field defects the following distinctions may be noted in arriving at a diagnosis: (1) In retrobulbar neuritis the visual defects are usually rapid and mobile, sometimes fluctuating, with a strong tendency to recover. Nerve-fiber-bundle defects, ring scotoma, or hemianopic features may be present. The Leber group is distinguished by absence of tendency to recovery and by hemianopic defects. (2) In toxic amblyopia the defects are always bilateral and nerve-fiber-bundle defects and hemianopic features are always absent. (3) In pressure interference the defects progress slowly. (4) In vascular disease the defect is sudden or rapid, unilateral, and stationary or progressive. A number of illustrative cases are described.

Harold F. Whalman.

12. VISUAL TRACTS AND CENTERS

Delord, Emile. **Concerning a case of considerable bilateral exophthalmos due to lesions of the hypophyseal region. Cure by mercurial treatment associated with deep radiotherapy.** Arch. d'Opht., 1932, v. 49, Dec., p. 799.

A man sixty-two years of age had an exophthalmos gradually increasing for three months. The fields remained normal, and there was no evidence of functional disturbance of the pituitary gland. Roentgenograms, however, showed marked destruction of the clinoid processes. Deep x-ray therapy was administered and thirty-one injections of biniodide of mercury were given intramuscularly. At the end of three months the position of the eyes was about normal. In spite of a negative blood Wassermann the lesion was considered syphilitic, and three similar cases are cited from the literature.

M. F. Weymann.

Horn, L., and Helfond, M. **Correlative cortical changes in brain of woman blind in one eye.** Wien. klin. Woch., 1932, v. 45, Oct. 21, pp. 1305-1336.

The authors studied the brain of a woman who had been blind in the right eye for ten years following a serpiginous ulcer of the cornea. Changes were found in the left hemisphere only, contralateral to the blind right eye. This change was similar to the correlative changes that were found in a deaf mute, the pathologic changes not being in the real acoustic area, but in the cortical field behind Heschl's transverse convolution. This region of the planum temporale has only indirect connections with the acoustic area.

Beulah Cushman.

Klar, J. **Acute optic encephalomyelitis.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 645.

During the summer of 1931 a number of cases of a peculiar and hitherto unseen affection of the optic nerve occurred. They were interpreted, if not as an independent disease, as a special form of disseminated encephalomyelitis. A severe acute retrobulbar affection of one eye was followed in a few days by the same in the other eye, the appearance being that of choked disc, generally with total but transient amaurosis, and terminating after weeks or months in recovery with or more rarely without functional defect. Four detailed clinical histories are given. Fever and analysis of the cerebrospinal fluid (positive globulin reaction, slight pleocytosis) showed the inflammatory character of the condition. The earlier and middle ages of life and the female sex seemed to be favored. The disease was very similar to multiple sclerosis. In this, however, bilateral retrobulbar

neuritis and papillitis are much rarer, the peculiar combination of disease of the optic nerve and tract is usually not observed, and the symptoms subside much faster. C. Zimmermann.

Shepkalova, V. M. **Hemianopsia in the experience of the Ophthalmologic Clinic of the Kuban Medical Institute.** Sovietskii Vestnik Opht., 1932, v. 1, pt. 6, p. 257.

Among 146,739 patients examined during the period from 1910 to 1929, twenty-six cases of hemianopsia were registered. Of these, homonymous hemianopsia was found in nineteen cases (right homonymous in twelve, left in six, lower in one) and heteronymous in nine cases (in six bitemporal, in one binasal). The etiology of homonymous hemianopsia was established in eighteen cases: syphilis in four, vascular disease in eight, trauma in four, acute infectious disease in one. In the group of heteronymous bitemporal hemianopsia, tumors of the brain were found in four cases, syphilis in two cases. The visual acuity was normal in most cases of homonymous hemianopsia, indicating preservation of macular perception. But in heteronymous hemianopsia the central vision became markedly and progressively defective. In discussing the pathogenesis of the various types of hemianopsia the author closely follows the work of Wilbrand and Saenger. M. Beigelman.

13. EYEBALL AND ORBIT

Bormacher, H. **Isolated symmetrical aleukemic lymphadenosis of the orbits and its differentiation from inflammatory pseudotumor.** Graefe's Arch., 1932, v. 129, p. 1.

Beside symmetrical lymphocytic orbital tumors, there may be unilateral affections or combinations with lymphocytic proliferation in the conjunctiva bulbi, choroid, pharynx, epipharynx, larynx, skin, and glandular organs, such as the mammae and the salivary glands. The author reported the findings in two men, sixty-one and fifty-nine years old respectively. There was bilateral exophthalmos, and under the tarso-orbital fascia could be palpated a number of small, round, indolent, and movable growths. All the eyelids were swollen. Histologic examination of an excised orbital growth disclosed in one case a collection of uniformly small lymphocytes without a germinal center. In the other case the lymphocytes with plasma cells and eosinophiles frequently formed typical large lymph follicles within a connective tissue capsule. The use of roentgen rays in the first case for a period of six weeks caused disappearance of the growths, of the exophthalmos, and of the lid swelling. Smaller doses of the rays in the second case, continued for over three months, produced considerable improvement but not a cure; the author attributing the poorer result in this case to the greater amount of connective tissue, plasma cells, and eosinophiles in the orbital growths of this patient. Antiluetic treatment produced no improvement. H. D. Lamb.

Delord, Emile. **Concerning a case of considerable bilateral exophthalmos due to lesions of the hyophyseal region. Cure by mercurial treatment associated with deep radiotherapy.** Arch. d'Opht., 1932, v. 49, Dec., p. 799. (See Section 12, Visual tracts and centers.)

Possenti, S. **Clinical and anatomico-pathological studies in a case of xanthomatosis bulbi.** Lettura Oft., 1932, 9th yr., July, p. 343.

Xanthomatosis was demonstrated histologically in an eye enucleated because of intolerable attacks of pain, total blindness, and intraocular hypertension. Fat droplets were found in all of the tissues except the lens and the vitreous. In the latter were numerous minute particles of cholesterin.

F. M. Crage.

Streiff, J. **Demonstration of the physico-optical factor of the visual disturbance in aniridia and in the albinotic eye, with remarks on Müller's protective glasses.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 625. (Ill.)

Streiff constructed models to simulate the peculiar optical conditions in aniri-

dia and the albinotic eye. In aniridia the light concentration is missing. This is unfavorable for the central image, which, however, remains distinct enough, and the disturbance through the optical factor appears less than one would suppose. In albino eyes the very unfavorable optical conditions may not only diminish vision, but perhaps contribute to prevent formation of the fovea, which normally is completed several months after birth. Streiff regards thin Mueller contact shells with sufficiently large scleral covering, and painted dark on the back, as the best practical protection against light in albinism. C. Zimmermann.

14. EYELIDS AND LACRIMAL APPARATUS

Baquis, M. **Alterations of the lacrimal sac in chronic dacryocystitis.** Lettura Oft., 1932, 9th yr., Sept., p. 419.

Histological examination of numerous lacrimal sacs was made after extirpation for chronic dacryocystitis. Macroscopic and histologic changes are described with particular references to three cases of tuberculosis of the lacrimal sac, in two of which there was also a conspicuous submaxillary adenitis on the same side as the sac infection. The microscopic findings confirm the opinion that total extirpation of the sac constitutes the proper treatment of such cases, in preference to the Toti operation or any of its numerous modifications. The prophylaxis of such eyes from complicating bulbar infections is thereby gained. (Photographs are shown of the two cases of tuberculous dacryocystitis with complicating submaxillary adenitis.) F. M. Crage.

Blair, V. P. **Repairs and adjustments of the eyelids.** Jour. Amer. Med. Assoc., 1932, v. 99, Dec. 24, p. 2171.

Seventeen cases of the plastic repair of various defects of the eyelids are reported and illustrated, showing the patient before and after operation, and the technique. The paper is most interesting and instructive, but too detailed to admit of abstraction. (Seventeen figures.) George H. Stine.

Folk, M. L., and Taube, E. L. **Vaccinia of the eyelids and conjunctiva.** Amer. Jour. Ophth., 1933, v. 16, Jan., pp. 36-39.

Kayser, B. **A rare accident at extirpation of the tear sac.** Klin. M. f. Augenh., 1932, v. 89, Nov., p. 657.

After cutting off the lower end of the right tear sac of a farmer, aged sixty-six years, a profuse hemorrhage occurred requiring tamponade and artery forceps. When it stopped the extirpation was completed, while the patient complained of constantly increasing violent pain in the eye and head, with protrusion of the eyeball, edema of the conjunctiva and swelling of the lids. The pupil was dilated and immovable. Evidently prompt cessation of the external hemorrhage was caused by bleeding behind the globe. Unfortunately the eye remained without perception of light. The profuse hemorrhage spoke for intense arteriosclerosis. Perhaps the vascular wall was so brittle that upon pulling it forward with the forceps during the cutting of the upper portion of the tear sac it broke further back, so that it bled at two places. Or the vessel might have retracted, although this was not very likely, because of inelasticity. C. Zimmermann.

Parker, H. L. **Bilateral facial spasm.** Amer. Jour. Ophth., 1933, v. 16, Jan., pp. 28-35.

15. TUMORS

Deplanche, M. **Papillomatous tumor of the anterior segment of the eye.** Arch. d'Opht., 1932, v. 49, Nov., p. 726.

After injury by a branch of a tree, a small mass developed and gradually increased in size until at the time of examination (six years after injury) the lids were held open by a large, hard, gray-red tumor mass presenting ulcerations on its surface. A diagnosis of epithelioma was made, and the eye was enucleated. The tumor mass had not perforated the cornea or even the angle. Microscopically the tumor consisted of stratified epithelium, and a diagnosis of papilloma, probably originating at the limbus, was made.

M. F. Weymann.

Hubin, R. **Curie therapy of palpebral epithelioma.** (Radium.) Bull. Soc. Belge d'Opht., 1932, no. 64, p. 20.

In Weekers' service at the University of Liége, epithelioma of the lids has been treated with radium regularly since 1925. Before that date the results obtained by this method were not very constant, but after adopting the technique described in detail by the writer the results were improved. Between 1925 and 1931 thirty-six cases were completely cured. The article includes thirty-six brief case reports giving dosage and results in each case. The author concludes that radium therapy has given him results superior to those from other forms of therapy.

J. B. Thomas.

Kern, Rudolph. **A case of cavernous hemangioma of the choroid.** Zeit. f. Augenh., 1932, v. 79, Nov., p. 21.

To the thirty-five cases of cavernous hemangioma of the choroid reported in the literature Kern adds clinical and histological details of a similar case. The tumor is characteristically slow in development. Vision is usually poor early in life, until sudden blindness from secondary retinal detachment sets in. The usual complications of intraocular tumor follow—cataract, iridocyclitis, and secondary glaucoma leading to enucleation. That there is no characteristic ophthalmoscopic picture is shown by the fact that the diagnosis has been made in vivo only three times.

F. Herbert Haessler.

Marin Amat, M. **Electrolysis and radium in the treatment of lid angiomata and comparative results.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, Nov., p. 604.

On the basis of two cases of extensive lid angiomata, reported and illustrated in detail, the writer concludes that bipolar electrolysis, which was used in one, and radium, which was used in the other, are equally effective, but that radium finds its indications in the more extensive lesions with involvement of neighboring structures and subject to hemorrhages, while electrolysis is an ample procedure in the circumscribed and uncomplicated cases.

M. Davidson.

Puscariu, Helene. **Mixed tumor of the upper lid.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 493 (Ill)

A woman aged forty-two years presented a cherry-sized tumor of the right upper lid which had started four years previously and gradually grew so that the patient could not open the eye. The skin was movable over it. It could be easily liberated from the skin and muscle, but was attached to the deeper layers, from which it was extirpated without opening the conjunctiva. Microscopically it consisted of pseudoglandular tissue and cysts with amorphous products of secretion, and between these were cell elements which reminded one of carcinoma and myxomatoid formations. The pathogenesis was doubtful, some authors assuming a conjunctival, others an endothelial, origin.

C. Zimmermann.

Sagita, Yozo. **Perithelioma of the deep nasal part of the orbit.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 488.

A woman aged sixty-two years complained for two years of her right eye. Two or three months previously the symptoms had become aggravated by double vision and buphthalmos, caused by an orbital tumor. This was extirpated with preservation of the optic nerve. Microscopically it consisted of stratified sarcomatous cells surrounding new-formed blood vessels. These cells had no relation to the endothelial cells, but started from the perithelium of the blood vessels, the histological details presenting the typical picture of perithelioma.

C. Zimmermann.

Vele, M. **Contribution to the study of the teratomata of the external angle of the conjunctival fornix.** Lettura Oft., 1932, 9th yr., Sept., p. 442.

Two such cases are described. Each growth contained portions of the lacrimal and Krause's glands, muscle fibers, bloodvessels and nerves. A brief history of the literature is given. (Bibliography and plates.)

F. M. Crage.

16. INJURIES

Amias, V. **Disciform keratitis in industrial accidents.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, Nov., p. 640. (See Section 6, Cornea and Sclera.)

Bonnet, Paul, and Paufique, L. **Subconjunctival lipoma.** Arch. d'Opht. 1932, v. 49, Dec., p. 795.

Typical lipoma under the temporal bulbar conjunctiva in a girl of eleven years is shown by a drawing and as seen in cross section under the microscope. Tissue resembling exactly an aberrant lacrimal gland was found at the most prominent point on the tumor. This aberrant gland may have been the origin of the tumor.

M. F. Weymann.

Filatov, V. P., Kalfa, S. J., and Brodski, B. S. **Stations for magnet help ("magnet centers") in occupational traumatism.** Sovietskii Vestnik Opht., 1932, v. 1, pts. 8-9, p. 355.

This article advocates the organization of "magnet" stations in industrial centers for the purpose of immediate and adequate help in cases of intraocular foreign body. These stations must be in operation day and night; they are to be equipped with magnets of the Haab, Hirschberg and Mellinger types. X-ray laboratories with standardized technique for localization should be at disposal.

M. Beigelman.

Halász, Cornelius. **Migration and spontaneous expulsion of intraocular fragments of copper.** Zeit. f. Augenh., 1932, v. 79, Nov., p. 32.

In four cases of intraocular foreign body a copper fragment was spontaneously extruded. The copper remained in the posterior part of the eye from four to eleven years. It took from two weeks to fourteen months for the fragment to wander into the anterior chamber, and the time which elapsed from the appearance of the copper in the anterior chamber to its spontaneous extrusion varied from four weeks to nine months. No eye lost its visual power completely, though in two it was reduced to counting fingers at one to two meters. Frank chalcosis occurred only once.

F. Herbert Haessler.

Knapp, P., and Büchtiger, P. **The question of injury of the eye by light in electric welding.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 456. (Ill.)

A man aged twenty-seven years, as guide of a welding group, and not wearing protective glasses, acquired a central retinitis with vision of 0.5, which, however, subsided after eight subconjunctival salt injections. Authors' investigations indicate that in electric welding, aside from the ultraviolet, so many light rays are effective that injury of the retina by these seems very possible. In two aphakic persons ultraviolet was visible to 335 millimicra, and within this range normal retinal perception existed with vision of 2/5.

C. Zimmermann.

Nardi, G. **The tolerance of the eye to endobulbar foreign bodies.** Ann. di Ottal., 1932, v. 60, June, p. 429.

In fifty-six cases in which foreign bodies had entered the eyeball, the tolerance of the eye was conditioned by the nature of the substance and the promptitude with which treatment was given. Much too depended on the location of the injury. When the foreign body had been retained for some time within the globe, or if it was in the neighborhood of the ciliary body, recrudescence of the inflammatory symptoms might be expected after a period of quiescence, and sympathetic involvements were to be feared.

Park Lewis.

Stoeker, F. **The value of direct roentgen skiagraphs of the eyeball, excluding the cranial bones, for detection and localization of intraocular foreign bodies.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 467. (Ill.)

Three cases are reported, in which the usual roentgen photographs of the skull did not show an intraocular foreign body, but this was made visible by applying the rays immediately on the eyeball. Beside the lateral exposure one must be made from above. This method is described in detail.

C. Zimmermann.

Wachtler, G. **Endophthalmitis with hypopyon or corneal abscess? Diagnosis cleared by direct roentgen skiagraphy of the eyeball.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 532.

The right eye of a laborer in a quarry was severely injured by a dynamite explosion in July, 1931. At the end of October enucleation was advised on account of endophthalmitis. Direct roentgen skiagraphy showed a foreign body near the corneal margin. A minute copper particle was removed and the eye saved. C. Zimmermann.

17. SYSTEMIC DISEASES AND PARASITES

Calhoun, F. P. **The ocular manifestations of neurasthenia.** Jour. Med. Assoc. of Georgia, 1932, v. 21, Nov., p. 424.

Several case histories are cited to show the varied and bizarre complaints. A certain proportion of ocular neuroses are due to sexual disorders and perversions. But one must be on the lookout especially for brain tumors.
M. E. Marcove.

Clark, J. S. **Purpura hemorrhagica of the Schönlein-Henoch type.** Arch. of Ophth., 1932, v. 8, Nov., pp. 649-653.

In this case there were swollen, painful joints, with purpuric spots on the extremities, scapula, and buttocks, excessive tenderness over the abdomen, some colic and vomiting, and tarry stools for several days. There was no excessive bleeding from the gums, nose, or bowels. Within twenty-four hours of the onset of the disease, there developed intraocular hemorrhage, iritis with dense corneal opacity, and loss of vision in both eyes. There was also a general uveitis. The author discusses the differential diagnosis between this and the ordinary purpura hemorrhagica. M. H. Post.

Crocco, A. **Diabetes in ocular diseases.** Arch. de Oft., de Buenos Aires. 1932, v. 7, March, p. 138.

This is an up-to-date review of the literature on this subject.

Damel, C. S. **Hysteria in ophthalmology.** Boletin de Informacion Oft., 1932, v. 5, June, pp. 190-201, and July-Aug., pp. 237-250.

This is a somewhat detailed discussion of the whole subject of hysteria, especially as applied to ophthalmology.
W. H. Crisp.

Fisher, J. H. MacLean, H., Souter, W. C., and Dodds, E. C. **Disorders of secretion of the endocrine glands associated with eye diseases.** Trans. Ophth. Soc. United Kingdom, v. 50, pp. 52-96.

This is a series of papers dealing with the present status of endocrinology in relation to ophthalmology. Diabetes, Graves' disease, myxedema, and parathyroid and pituitary diseases are discussed by Fisher. MacLean discusses particularly diabetes and the interrelation of pancreatic and liver function. Souter takes up the ocular phenomena peculiar to each of the endocrine glands. Dodds discusses the biochemistry of the endocrines.
Harold F. Whalman.

Fuchs, A. **Concerning ophthalmic migraine.** Rev. Oto-Neuro-Oft., 1932, v. 7, July, p. 281; and Arch. de Oft. Hisp.-Amer., 1932, v. 32, Aug., p. 432.

The author records that his father, Ernst Fuchs, was a sufferer from this condition during his entire life, and used his attacks as opportunities to make detailed studies of the condition. His scintillating scotomata varied in length from eleven to thirty-six minutes. These scotomata are usually present in each eye, and in the same portion of the visual field. They are near the point of fixation, although tending to draw away in the course of the attack. The characteristic zigzag lines of varied colors may be confused with the rings seen around lights in acute glaucoma, with which the condition has been known to merge. Four cases are reported in detail.

For alleviation before the attacks have become habitual, or permanent changes induced, the author recommends a glass of strong red wine along

with pyramidon and, if circumstances permit, 100 mg. of acetylcholin hypodermically. A. G. Wilde.

Gafafer, W. M. **Eye color and disease of the upper respiratory tract.** Amer. Jour. of Hygiene, 1932, v. 16, Nov., p. 880.

The object of this paper was to determine the presence or absence of association between the color of the eyes and attacks of upper respiratory disease in a group of adults. For thirty-five weeks, beginning in September and ending in May, the author studied 343 cases of both sexes, ranging in age from 17 to 59 years. He found that there was no significant difference between blue-eyed and brown-eyed individuals in respect to frequency, severity, or type of upper respiratory disease.

M. E. Marcove.

Gallerani, G. **Allergic phenomena from the ingestion of milk. Transitory amaurosis with scintillating scotoma and palpitation of the heart.** Ann. di Ottal., 1932, v. 60, April-May, p. 249.

The author, himself the patient, aged thirty-five years and in excellent health, was attacked one morning with transitory amblyopia with scintillating scotoma and hemianopsis accompanied by light migraine. After a careful study of substances ingested it was found that similar attacks occurred after taking cow's milk, either alone or associated with other articles of food. It did not follow the use of cheese or of butter. The allergen was imperfectly digested casein through one of its degradations, the toxin acting through the psycho-optical area or the anterior quadrigeminal bodies with the effect of a peripheral retinal angiospasm. There seemed to be hereditary susceptibility, as a young relative suffered from cardiovascular acceleration whenever milk was taken. There was no return of the symptoms in either case as long as cow's milk was rigidly excluded from the dietary. Park Lewis.

Howell, C. M. H. **Ocular manifestations of lesions of the fifth cranial nerve.** Brit. Med. Jour., 1932, Oct. 29, p. 786. (See Section 6, Cornea and sclera.)

Hrankovicova, L. **The use of Ponndorf's vaccine A for diagnosis and treatment in eye diseases.** Oft. Sbornik, 1932, v. 7, pp. 81-84.

During a period of eight years, the vaccine was used diagnostically in 214 cases: in seventy-five cases the reaction was positive. In sixty cases the vaccine was used for treatment, five to fifteen doses being used. The results were satisfactory and lasting. To date there have been no recurrences.

G. D. Theobald.

Lagrange, H. **Ranke's conception and the determinism of ocular tuberculosis.** Ann. d'Ocul., 1932, v. 169, Nov., pp. 876-882.

The first part of the paper generalizes somewhat on the fundamental systemic pathology of tuberculosis. Ranke speaks of (1) an initial stage of allergy with a tendency towards sclerosis; (2) the second stage, a generalization of bacilli by the blood stream and allergic hypersensibility, this state corresponding with most clinical forms of the disease; (3) the stage of spread by contiguity, in which allergy is lessening. Then follows an interpretation of ophthalmological application of this concept. Ocular tuberculosis should always (with rare exceptions) be considered as an endogenous manifestation.

H. Rommel Hildreth.

Moore, R. F. **Ocular manifestations of lesions of the fifth cranial nerve.** Brit. Med. Jour., 1932, Oct. 29, p. 783.

The history and pathology of herpes zoster ophthalmicus are reviewed. The most important complications are corneal affections, iridocyclitis, ocular palsies, and optic atrophy. Iridocyclitis may result in glaucoma. Optic atrophy may occur early but is not frequent. The author does tarsorrhaphy in all cases in which the sensitivity of the cornea is markedly disturbed.

M. E. Marcove.

Neame, Humphrey. **Affections of the eye due to virus.** (Symposium.) Trans.

Ophth. Soc. United Kingdom, 1931, v. 51, pp. 24-41.

The material investigated was distemper in ferrets and dogs: the disease produces a parenchymatous keratitis closely resembling syphilitic interstitial keratitis in human beings. Opportunity presented itself to examine histological sections and study in microscopic detail the results of the disease process; and several fine photomicrographs and drawings are reproduced. (Discussion.)

J. G. Kinney.

Perdrau, J. R. **Affections of the eye due to virus.** (Symposium.) Trans. Ophth. Soc. United Kingdom, 1931, v. 51, pp. 5-10.

A discussion of the more familiar characters of viruses and a comparison with those of visible bacteria constitute the major portion of this report. The paper is general and not particularly concerned with the eye. The author defines and discusses viruses as to microscopic size, filterability through the Birkefeld and Pasteur-Chamberland filter candles, and changed filterable properties in broth or with temperature change; and he also makes note of their relation to inclusion bodies. He mentions the failure to cultivate viruses except on or in association with living tissue. Tissue specificity and its relation, in the study of viruses, to the manifestation of disease are nicely illustrated. The properties of a virus after continued passage in specific tissues and this phenomenon in its relation to the animal or species utilized in experimentation, are connected with important points in immunity.

J. G. Kinney.

Ridley, F. T. **Affections of the eye due to virus.** (Symposium.) Trans. Ophth. Soc. United Kingdom, 1931, v. 51, pp. 10-16.

The author deals with diseases of the eye in animal and man due to viruses, including the viruses of vaccinia and herpes febrilis, the salivary virus of Levaditi, and Perdrau's virus. A good clinical and histological description of vaccinal keratitis is given, with the presence of Guarneri bodies in the epithelial cells as a distinguishing feature. The keratitis of febrile herpes varies with the strain used: both a neurotropic and dermotropic type are noted. The author discusses the possibility that corneal herpes associated with labial herpes, and the herpes preceding dendritic ulcer of the cornea, are both due to the virus of febrile herpes. The author's opinion and a critical tabulated résumé of Grüter's work on this subject do not bear out such an assumption. Of herpes zoster, only a similarity in skin and corneal lesions can be shown; there is no experimental evidence that the eye lesions are due to a transmissible virus.

J. G. Kinney.

Sabbadini, D. **Pansinusitis with orbital involvement (presence of the Vincenti-Sanarelli heliconema). Riv. Oto-Neuro-Oft.,** 1932, v. 9, Mar.-Apr., pp. 124-151.

A man of twenty-six years showed marked edema of the left eyelids, chemosis and purulent discharge from the conjunctiva, and an ulcer at the level of the internal canthal ligament, and communicating with the ethmoid, from which some pus was discharged. Transillumination and radiography showed opaque left frontal ethmoid and maxillary sinuses. The bacteriologic examination of the material taken from the orbital fistula, the pharynx and the nose showed Staphylococcus pyogenes and the heliconema of Vincenti-Sanarelli. General treatment and operations on the sinuses did not stop the pathologic process and the patient died from septicemia. The heliconema associates itself with the germs of a primary infection, which in this case were staphylococci. It is found also in chronic granulomatous infections like tuberculosis and syphilis and in neoplasms in the stage of necrosis. (Four figures and an extensive bibliography.)

M. Lombardo.

Santonastaso, A. **Ocular changes in leprosy.** Ann. di Ottal., 1932, v. 60, April-May, p. 276. (See Amer. Jour. Ophth., 1932, v. 15, July, p. 679; Sept., p. 894; and Nov., p. 1112.)

Histopathological researches occupy the first part of this elaborate study, which is a continuation of earlier papers by the same author. It treats of the lids, the conjunctiva, and the lacrimal passages. A second part is on histochemistry. A large number of cases are described and illustrated by excellent photomicrographs, one in color.

H. D. Scarney.

Savin, L. H. **Affections of the eye due to virus.** (Symposium.) Trans. Ophth. Soc. United Kingdom, 1931, v. 51, pp. 22-24.

Vaccination is discussed in relation to the eye. The history of a case which resulted in sinus thrombosis is reviewed. In a second case smallpox infection resulted in a corneal ulcer. It is concluded that smallpox or vaccinia virus either activates staphylococci and streptococci or lowers the patient's resistance to secondary invasion. (References and discussion.)

J. G. Kinney.

Steinbugler, W. F. C. **Diseases of common interest to the dentist and the ophthalmologist.** New York State Jour. of Med., 1932, v. 32, Nov., p. 1223.

Whether pyorrhea itself is a source of infection is still a debated question. Many authors believe that this condition is not a common source of eye inflammation. The most dangerous forms of dental infection are those of the pulp —pulpless teeth and apical abscess. These are usually free from direct symptoms and hence are unsuspected. Impacted and ectopic teeth may at times give rise to inflammatory conditions of the eye, but as a general rule they produce only reflex disturbances.

The exact mode of transmission of the eye infection from a dental focus is still open to question, but direct transmission through the bones, direct extension of the process along the periosteum to invade the orbit, and transfer by the blood stream are thought the usual methods of infection. In some cases, it is suggested, the infection spreads directly from the diseased tooth to the eye along the nerves, while the lymphatics undoubtedly play a part in transmission.

Any part of the eye may be affected, but the iris, ciliary body, and choroid are the most frequently involved. The infection is usually on the same side, and the upper jaw is responsible for more infection than the lower.

The incidence of infection in teeth is almost as high in the group with negative x-ray findings as in those with positive findings. The absence of x-ray evidence of infection at the apex of a pulpless tooth never excludes the presence of active infection. The author concludes that as a general rule conservatism should be practiced regarding the extraction of teeth. But in doubtful cases the eye should be given first consideration. M. E. Marcove.

Stieren, E., and McKee, G. J. **Complete unilateral ophthalmoplegia externa due to ethmosphenoiditis.** Pennsylvania Med. Jour., 1932, v. 36, Nov., p. 84.

A man of forty-two years suddenly lost the power to raise his left upper lid and had severe frontal and occipital pain. There was a slight exophthalmos which could be reduced under moderate pressure; and a fixed eyeball. X-ray examination revealed suppurative sphenoiditis and ethmoiditis on the same side; he also had a deviated septum. The following day, submucous resection, turbinectomy, and exenteration of the ethmoid and sphenoid cells were done, free pus being obtained. Three weeks later the patient had entirely recovered from the ptosis and had full movement of the globe. Slight exophthalmos remained. M. E. Marcove.

Warschawski, J. **Trachoma experiences in Baku.** Klin. M. f. Augenh., 1932, v. 89, Oct., p. 504.

Trachoma in Baku is endemic and very common, but is decreasing from year to year (from 31.5 percent of all ambulant patients between 1905 and 1907 to 20.8 percent in 1930). It mostly affects the domestic Turkish population, rarely the immigrated Russians. It is a decided family disease, and the family is the focus of its spreading.

Children before school age are infected by their family. Trachoma is not propagated in school, and no new infections were found in school. The treatment in schools has proved very successful. C. Zimmermann.

Williamson-Noble, F. A. **Affections of the eye due to virus.** (Symposium.) Trans. Ophth. Soc. United Kingdom, 1931, v. 51, pp. 16-22.

Reference is made to a recent classification of herpetic diseases of the eye by Löhlein to indicate the extent of our definite knowledge as to eye diseases due to viruses. The relation of tissue resistance to virus cases is illustrated by a case of neuropathic keratitis following section of the trigeminal nerve for neuralgia. Other examples include recurrent erosion of the cornea as the exciting trauma which allows herpes virus to affect the weakened epithelium. The writer digresses to describe the care and treatment of a corneal herpes zoster with resulting calcareous deposits. The possibility of extension of virus infection by way of nerve structures is discussed. Sympathetic ophthalmia as a possible virus disease is covered in cases published by Sommer, Noyes, and others. The work of Szily in investigating virus from zoster cases may lead to information as to the etiology of sympathetic ophthalmia. Here again the difficulty of experimental transmission makes the result an open question. (Discussion.)
J. G. Kinney

18. HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Byers, W. G. M. **Trachoma in Canada.** Canadian Med. Assoc. Jour., 1932, v. 27, Oct., p. 372.

This paper contains information obtained for the International Ophthalmological Congress at Amsterdam in 1929. Summarizing the findings, one can say that while the non-Indian population of Alberta, of British Columbia (apparently), and of Canada east of Manitoba is virtually free from trachoma, Saskatchewan and especially Manitoba have a serious situation on their hands. Trachoma among the Indians of Canada constitutes a public health problem of the first magnitude. (Four references.) Ralph W. Danielson.

Courey, T. L. de. **Interstitial keratitis and the Workmen's Compensation Act.** Trans. Ophth. Soc. United Kingdom, v. 50, pp. 556-564.

The article deals with the responsibility of insurance companies in cases of interstitial keratitis arising from injuries of varying severity, and also the liability of a surgeon who operates upon an eye which later develops interstitial keratitis. There is a conflict of opinion. Harold F. Whalman.

Damel, C. S. **Acquired anophthalmia and permanent disfigurement.** Boletin de Informacion Oft., 1932, 5th yr., July-Aug., pp. 227-237.

This rather lengthy paper is devoted to criticism of an expert opinion presented to an Argentine civil court on the question whether loss of an eyeball involved permanent facial disfigurement. The expert opinion held that no permanent disfigurement was involved, but the author maintains that in such a case there is permanent disfigurement which will increase in course of time.
W. H. Crisp.

Eagar, W. McG. **The English program for the blind.** Outlook for the Blind, 1932, v. 26, Sept., p. 144.

This paper outlines in some detail past and present programs by the English in caring for the blind and in helping the blind to care for themselves.
Ralph W. Danielson.

Frey, Guernsey. **Practice of ophthalmology.** Amer. Jour. Ophth., 1932, v. 15, Dec., pp. 1138-1143.

Irwin, R. B. **Uniform Braille for the English-speaking world achieved.** Outlook for the Blind, 1932, v. 26, Sept., p. 137.

After years of discussion there has finally been an agreement on a code so that British and American books can now be interchanged.
Ralph W. Danielson.

Keith, A. **The Bowman Lecture. The Genius of William Bowman.** Trans. Ophth. Soc. United Kingdom, v. 50, pp. 32-51.

Bowman did more to advance the science of ophthalmology in England than any of his contemporaries. He studied medicine at King's College, entering in 1837, and in 1851, at the age of thirty-five years, he was appointed full surgeon at Moorfields Hospital.

He was profoundly influenced by the great physiologist and anatomist Robert Bentley Todd. To Todd's "Physiological anatomy and physiology of man" Bowman contributed studies on the microscopic structures of the skin, nerves, sense organs, alimentary canal, lungs, liver, kidneys, testes, muscles, bone and cartilage; compiling all data from his own observations with the microscope. His work on the cornea holds good today. He defined the structure and function of the ciliary body.

He saw the circular and radial muscles of the iris, did not regard the rods and cones as visual perceptors because they were on the outer or "wrong" side of the retina.

Harold F. Whalman.

Lloyd, R. I. **The first American eye journal and its editor.** Amer. Jour. Ophth., 1932, v. 15, Dec., pp. 1123-1126.

Nicolich, Merida. **Cause and prevention of blindness.** Rev. Cubana de Oto-Neuro-Oftal., 1932, v. 1, May-June, p. 25.

This is a statistical study of the causes of blindness based upon a survey of Malaga, Spain. Although the author does not state exactly what is meant by blindness, 874 were found so afflicted, a proportion of one per 689 of the inhabitants. The figures are stated not to be final, and a complete survey would probably show a rate about fifty percent greater. Various types of keratitis accounted for 22 percent, trachoma 20 percent, syphilitic optic atrophy 13 percent, conjunctivitis neonatorum 12 percent, blennorrheal conjunctivitis of the adult 5 percent, glaucoma 4 percent, smallpox 3 percent, surgical infections 3 percent, microphthalmia 3 percent, infantile glaucoma 3 percent, sympathetic ophthalmia 2 percent, detachment of the retina 2 percent, diphtheria 1 percent, pigmentary degeneration of the retina 1 percent, post-pneumonia optic atrophy 1 percent, alcoholic optic atrophy 1 percent, Leber's disease 1 percent, optic atrophy of unknown type 1 percent, syphilitic iridocyclitis one percent and congenital cataract 1 percent. Thus 7 percent are congenital in origin, and 93 percent arise from acquired conditions. The causes of blindness are taken up in detail, and measures outlined for prevention. A. G. Wilde.

Sherman, E. S. **Industrial eye injuries and compensation claims arising therefrom.** Jour. Med. Soc. of New Jersey, 1932, v. 29, Oct., p. 761.

The three essential elements, visual acuity, binocular single vision (muscle function), and field of vision, are taken into consideration in the determination of functional incapacity. Tables are given showing the percentage loss of vision, of field, and of muscle function.

M. E. Marcove.

19. ANATOMY AND EMBRYOLOGY

Baquis, M. **Observations on the development of the lids, with particular reference to the formation of the tarsus.** Lettura Oft., 1932, 9th yr., Aug., p. 367.

The author's results were based on his observations of five embryos and fetuses, the youngest embryo measuring 11 mm. The formation of the tarsus begins at about the tenth week of intrauterine life as a thickening of mesenchymal cells in the posterior portion of the lid. The glands of Moll appear in the third month. The meibomian glands and fibers of the orbicularis are first seen in the six-month fetus. (Bibliography and plates.)

F. M. Crage.

Mann, Ida. **The development of the cornea.** Trans. Ophth. Soc. United Kingdom, 1931, v. 51, pp. 63-88.

The author confirms the works of Laguesse, Seefelder, and Hagedoorn on

development of the cornea in the chick and terrapin, with further observations in human embryology. Better observation is possible with freshly fixed material, especially in relation and position of cell layers, clefts, and gel-filled cavities found in the development of the eye. A comparative study is illustrated with several figures showing development of early corneal epithelium. The mesodermal cells extending between the lens and the surface ectoderm are pointed to as the beginning of endothelial cell structure. With the limiting cells established, a cell group of nucleated mesoderm in the shape of a wedge grows in from the "open corner" to form the substantia propria. This structure is a rather transient stage in the human eye, and because of its extremely thin cell layer is not easily demonstrated. Thick cell layers called the postendothelial tissue condense to form the pupillary membrane and iris stroma. Development of the iris is briefly mentioned in its relation to the cornea and anterior chamber. (Discussion.) J. G. Kinney.

Perez Llorca, J. **A contribution to the study of the origin and nature of the vitreous.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, Oct., p. 540.

The author offers a historical review, and detailed description (with microphotographs and colored drawings) of observations on chick and mammalian embryos. No mesodermal layer was at any time observed between retina and lens. A mesodermic button was found interposed between the lips of the fissure in the more advanced embryos. From various details of vitreous development encountered, the author concludes that the vitreous is not a tissue and that any cellular elements found in it at any stage of its development come from outside, accompanying the vessels and disappearing with them. The vitreous is not a product of secretion, and cannot be described as exclusively of ectodermal origin. M. Davidson.

Van der Hoeve, J. **Eye and amnion bands.** Trans. Ophth. Soc. United Kingdom, v. 50, pp. 237-243.

It is well known that amnionic bands or other ovial membranes may, by strangulation in utero, seriously damage or even amputate fingers, toes, and limbs. Several congenital malformations of the face are attributed to the presence of these bands, including colobomata of the eyelids, dermoids and leucomata of the eye, open facial fissures, scars at the surroundings of the eye as remnants of the amnionic bands, and divided lacrimal pathways. Several cases are recorded.

Harold F. Whalman.

NEWS ITEMS

News items in this issue were received from Dr. Paul G. Moore, Cleveland, Ohio. News items should reach **Dr. Melville Black, 424 Metropolitan Building, Denver,** by the twelfth of the month.

Deaths

Treacher Collins, London, another of our greatest ophthalmologists, died on December 13.

After a few days illness, Dr. G. Oram Ring, Philadelphia, died on January 17. Dr. Ring was one of the faithful news item gatherers.

Dr. Howard W. Levengood, Santa Monica, California, aged fifty-one years, died on January 13.

Ernest Clarke, London, died recently at the age of seventy-five years. He was chairman of the Board of Directors of the British Journal of Ophthalmology.

Dr. Ralph Deems Fox, Bloomington, Illinois; age fifty-five years died December 31, of carcinoma of the pleura.

Dr. Arthur S. Rogers, Saginaw, Michigan, aged seventy years, died December 4, from injuries received in an automobile accident.

Miscellaneous

The Swedish Medical Society has awarded the Gullstrand Gold Medal to Priestley Smith, emeritus professor of ophthalmology, University of Birmingham, England, for his ophthalmological researches, especially regarding glaucoma and the permanent growth of the lens. The medal has not been awarded since 1922.

Anyone having extra copies of the American Journal of Ophthalmology for the years 1918 and 1920, of which they wish to dispose, please communicate with the Ophthalmic Publishing Company, 508 Metropolitan Building, Saint Louis.

Societies

The Section on Ophthalmology of the College of Physicians of Philadelphia met on Thursday, January 19. Dr. H. Maxwell Langdon spoke on "The use of adrenalin in ophthalmology", and by invitation, Drs. James B. Shipman, Nathan B. Stauffer, J. B. Feldman and F. A. Faught, spoke on "Coloboma of the optic nerve", "Eye lesions caused by sinusitis", "Demonstration of a new pupillometer and illuminometer", and "Medical economics", respectively.

The Fourth Congress of the Pan American Medical Association will be held at Dallas, Texas, March 21-25, 1933. Dr. John O. McReynolds is President of the Congress.

A very interesting and comprehensive program has been planned. There will be many instructional courses with round table discussions and about two hundred papers from distinguished physicians from all over the Western Hemisphere. Dr. Thomas B. Holloway is president of the English Speaking Committee of the Section of Ophthalmology.

The last meeting for the year 1932 of the Eye, Ear, Nose and Throat Section of the San Francisco County Medical Society was held on November 22, 1932.

Eight meetings were held during the year and eighteen regular papers were presented by members of the Section.

Dr. R. C. Martin has been chairman.

In February Dr. Howard Fleming presented a paper on "The eye, ear and accessory sinus complications in cases of head injury".

At a subsequent meeting, Dr. Howard Naffziger outlined the progress which he and his associates have made in the study of the pathology of progressive exophthalmus.

Dr. W. Barclay Stephens of Alameda presented his very extensive series of photographs of fundus lesions.

Dr. William McKim Marriot, Dean and Professor of Pediatrics at the Washington University Medical School at St. Louis, was present at the March meeting and contributed a valuable discussion to Dr. Lewis Morrison's paper on "Infantile mastoiditis".

Two reviews of interesting blood dyscrasia were presented and discussed during the past year, the first was on "Ocular complications of agranulocytic angina" by Dr. Hans Barkan and the "Relation of hemophilia to operative procedures" was discussed by Dr. Harold Fletcher.

Dr. Gerald B. O'Connor and Dr. George Warren Pierce presented a paper on early grafting of burns of the eye.

A valuable comparison of the relative efficiency of the so-called precision lenses which the various manufacturers of spectacle lenses have placed on the market, was presented by Dr. Avery M. Hicks. This paper, by a man particularly well trained in the mathematics and physics of lenses, aroused considerable interest among the ophthalmologists and will be elaborated and subsequently published in a suitable journal.

It has been the custom for members to bring before the Section for examination and discussion, unusual cases which come to their attention in private and clinic practice. This has been a particularly interesting and helpful feature of the meetings.

The following officers were elected for 1933: George N. Hosford, M.D., Chairman; Russell Fletcher, M.D., Secretary.

The same general policy will prevail throughout the meetings scheduled for the current year.

George N. Hosford, M.D., Secretary.

Personals

Under the auspices of the faculty of medicine of Harvard University, Dr. Walter B. Lancaster gave a public lecture, January 29, on "Sparing the eyes".

Dr. Pillat, until recently in Peiping, has been appointed successor to Professor Lauber as head of the eye department of the Painz Hospital of the city of Vienna.

Dr. Luther C. Peter was the guest at a joint meeting of the Louisville Eye, Ear, Nose and Throat Society and the Jefferson County Medical Society, held in Louisville, Kentucky, on January 23. The subject under discussion was "Recent advances in squint".

Dr. Harry Friedenwald, Baltimore, spoke before the Chicago Ophthalmological Society on January 6 on "Retinal vascular disease, its relation to general vascular disease, with special reference to hypertension".

Dr. Charles Weiss, director of clinical and research laboratories, Mount Zion Hospital, San Francisco, gave six lectures during January and February on the bacteriology and immunology of infectious diseases of the eye.

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